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# USSR Report

CHEMISTRY

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USSR REPORT  
CHEMISTRY

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## ADSORPTION

UDC 535.37 541.183

### ADSORPTION THERMOLUMINESCENCE OF OXIDES OF MAGNESIUM AND CALCIUM IN OXYGEN

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 2 Feb 84) pp 425-427

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[Abstract] Adsorption thermoluminescence appears during heating of an object as a result of prior gas adsorption. The present article reports on study of the bond between this phenomenon and adsorboluminescence by comparing the quantity of emitted quanta, the influence of the gas medium and the role of desorption. The nature of illumination centers is also analyzed. The Calvet microcalorimeter used and the FEU39A with various filters used to measure heat of illumination and ultraviolet rays, respectively, were the key innovations of the method. Results showed that MgO produced 92-113 kilojoules/mol, depending on temperatures and oxygen content, as found by previous studies. CaO produced 117-138 kilojoules/mol. Addition of MoO<sub>3</sub> to MgO increased that figure to 250 kilojoules/mol, but brought no changes in intensity or spectra. Physical adsorption of O<sub>2</sub> at 78 K saturated the surface in dependence on oxygen pressure, with a tunneling effect from near-by electron donors to the adsorbed oxygen. At above 78 K in the presence of O<sub>2</sub>, its chemisorption took place as temperature increased and O<sub>2</sub><sup>-</sup> ions formed that contributed to the luminescence. The two types of luminescence were found to have identical spectral characteristics and numbers of emitted quanta. The conclusion is that adsorption luminescence is "unfrozen" adsorboluminescence. Figure 1; references 14: 10 Russian, 4 Western.  
[234-12131]

## DRYING LIQUID HYDROCARBONS ON NATURAL AND SYNTHETIC MINERAL ADSORBENTS

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 115-117

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[Abstract] Studies were conducted on a number of natural and synthetic mineral adsorbents for the removal of water from various liquid hydrocarbons (benzene, toluene, n-paraffins). The experimental findings demonstrated that pretreatment of the adsorbents (e.g., alumina, mordenite, silicates) with 6 N sulfuric acid improved water extraction. A further increase in the concentration of the sulfuric acid had a negative effect, presumably because of disruption of the adsorbent structure.  
[235-12172]

## STUDY OF ADSORPTION PROPERTIES OF ANION EXCHANGE RESINS IN RELATIONSHIP TO SOME ANIONS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIIMIYA I KHMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 28, No 3, Mar 85  
(manuscript received 14 Mar 83) pp 71-74

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[Abstract] The goal of this work was to investigate adsorptional properties of various anion exchange resins in respect to inorganic anions (sulfur and chloroacetic anions,  $\text{HCO}_3^-$ ,  $\text{CO}_3^{=}$ ) present in bleaching solutions and effluents of cellulose-paper industry (CPI). Three resins were studied: highly basic resin varion AT-600, intermediate AV-16G and a weakly basic AN-31. The adsorption properties were evaluated by their equilibrium static exchange capacity (ESEC). The data obtained reflected the selectivity of anion exchange resins towards the anions being exchanged, making it possible to construct a series of selectivity which reflected data already reported in literature. The differences in the adsorbability of various anion exchange resins could be explained by different dependence of the selectivity constants on the degree of occupancy of the resin with a given ion. Figure 1; references 16: 12 Russian, 4 Western.  
[244-7813]



SPECTROSCOPIC METHOD OF STUDYING COPOLYMERS OF VINYLPIRROLIDONE WITH  
CROTONIC ALDEHYDE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 85  
(manuscript received 14 May 84) pp 28-31

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[Abstract] Polymers of vinylactames and especially of vinylpyrrolidone show great promise because of their high solubility and ability to form complexes, and their low toxicity. Recently, research has focussed on reactions with aldehydes and related compounds, some of which have tuberculostatic properties. The present article reports on study of initial states and changes in such copolymers during the reaction process based on assessment of quantitative and qualitative composition of a vinylpyrrolidone-crotonic aldehyde copolymer containing 5-30% of the latter by molecular weight. Samples were prepared and spectral analyses made in an NaCl cuvette, with results compared to those for chloroform in the same vessel. Functional analysis was made by oxidation in an aqueous solution. With relative error reduced by intensification to 3-5%, results indicated that systematic study of infrared spectra of the vinylpyrrolidone-crotonic aldehyde copolymer yielded dependable quantitative and qualitative pictures of their composition. Figures 2; references 12 (Russian).  
[233-12131]

## DISSOCIATION OF CARBON MONOXIDE MOLECULES ON PLATINUM SURFACE UNDER EFFECTS OF ELECTRON IMPACT. DETERMINING EFFECTIVE CROSS-SECTION OF DISSOCIATION

Moscow KHEMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 26 Dec 83) pp 392-397

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[Abstract] Recent wide use of electronic surface bombardment and Auger electron spectroscopy has promoted interest in effective cross-section of dissociation as a means for determining changes in surface composition after such processing. The present article reports on dissociation of the CO molecule adsorbed on polycrystalline platinum. A thermodesorption mass spectroscopic method was used to determine composition, state and concentration of adsorbed molecules. The test material was 70% CO, 25% H<sub>2</sub> and 5% (H<sub>2</sub>O+CO<sub>2</sub>+CH<sub>4</sub>). Vacuum of  $1 \cdot 10^{-6}$  mm of mercury and temperatures of 900°C to eliminate carbon compounds, and 1000°C to eliminate oxygen, were maintained to prepare the surfaces. Bombardment was conducted at room temperature at  $2 \cdot 10^{-6}$  mm of mercury vacuum. Spectral values obtained in thermodesorption of CO in a vacuum and in O<sub>2</sub> reflect the appearance of carbon atoms on Pt surfaces as a result of electronic-stimulated dissociation of adsorbed CO molecules. The process was uniformly effective for all CO molecules. The given method is superior to Auger electron spectroscopy, because of its simplicity and the possibility of differential assessment of concentration and formation of the products of electron-stimulated dissociation. Figures 4: references 16: 3 Russian, 13 Western.  
[234-12131]

## DETERMINATION OF OXYGEN IN ETHYLENE BY ELECTROCONDUCTIVITY OF ZINC OXIDE

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 15 Jul 83) pp 751-752

GUTMAN, E. Ye., MYASNIKOV, I. A., KOLOMOYTSEV, V. S., ZAV'YALOVA, L. M., ALIYEV, T. B. and KONSTANTINOV, V. I., Scientific Research Physical-Chemical Institute imeni L. Ya. Karpov, Moscow

[Abstract] Current methods for determination of oxygen in a stream of ethylene show a number of difficulties: need for bulky, complex apparatus, excessive use of energy, etc. The goal of this study was to evaluate in principle the possibility of using semiconductor type detectors for determination of oxygen, to determine the sensitivity of such methods, the time needed for analysis and to evaluate the reliability of these

detectors during extensive use. Indeed, it was shown that oxygen can be determined in ethylene by electroconductivity of zinc oxide films, based on various studies of static and kinetic electroconductivity. Figure 1; references 9: 5 Russian (1 by Western author), 4 Western.  
[248-7813]

DETAILED METHOD FOR DETERMINATION OF LOSSES DUE TO FRICTION, ABRASION AND ROLLING OF PROTECTIVE TIRE RUBBER

Moscow KAUCHUK I REZINA in Russian No 3, Mar 85 pp 29-32

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[Abstract] Detailed mechanical description is provided of a device and techniques involved in determination of tire rubber wear under different conditions. The approach is meant to complement routine physical and chemical methods of analysis by determining losses due to slippage as a result of traction, braking and side forces acting on the tire. The equipment designed for the test allows for measurement under conditions simulating icy, wet and dry road conditions. Data were derived for 5 types of rubber, with detailed information presented on butadiene-styrene 177-HF rubber developed in the GDR. The range of errors for determination of friction losses on a wet surface was  $\pm 3\%$ , on icy surface  $\pm 10\%$ , for abrasion losses  $\pm 4\%$ , and for rolling resistance  $\pm 2\%$ . Figures 8; references 14: 2 Russian, 4 East German, 8 Western.  
[232-12172]

PRODUCING SYMMETRICAL DIACETYLENE DIESTERS OF CERTAIN ALIPHATIC ACIDS

Tashkent UZBEKSKIY KHMICHESKIY ZHURNAL in Russian No 1. Jan-Feb 85  
(manuscript received 28 Apr 84) pp 36-38

MAKSUMOV, A. G. and ERGASHEV, M. S., Tashkent State Medical Institute

[Abstract] Chemical and biological properties of diacetylene compounds are of wide application in medicine, agriculture and chemical production. Their biological activity studied during the course of several years is the subject of the present article. Oxidational dimerization of propargylic ester was conducted in methyl alcohol and dry pyridine in the presence of cuprous chloride. This was followed by distillation in a deep vacuum. The resulting substances were studied by elemental analysis and examination of infrared and NMR spectra. The preparations were found to have a controllable effect on the pathogen of intestinal infections and on purulent microorganisms. Details of chemical procedures used in producing the tested compounds are summarized. Table 1; references 6 (Russian).  
[233-12131]

## CATALYSIS

UDC 541.128:547.313.3:547.535-39:546.77:54-386:547.422

### CATALYTIC EPOXIDATION OF PROPYLENE BY ISOPROPYLBEZENE HYDROPEROXIDE ON MOLYBDENUM COMPLEXES WITH PHOSPHINE, ARSINE OR STIBINE LIGANDS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 21 Dec 83) pp 79-83

LEONOV, V. N., STOZHKOVA, G. A., BELYI, A. A., USTYNYUK, N. A.,  
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[Abstract] In view of recent reports that activity and selectivity of catalysts in epoxidation of olefins can vary depending on the ligand surroundings of the Mo atom, an evaluation was conducted on the effectiveness of several different Mo catalysts on the epoxidation of propylene by isopropylbenzene hydroperoxide (IPBH). The specific complexes that were evaluated consisted of Mo complexes with triphenylphosphine, triphenylarsine, and triphenylstibine ligands. Comparative data showed that introduction of the triphenylphosphine ligand led to considerable improvement in selectivity and efficiency: for example, changing over from  $\text{CpMo(CO)}_2\text{-NO}$  to  $\text{Cp(CO)Mo(NO)PPh}_3$  increased the conversion of IPBH from 86 to 92 mole%, while improving selectivity ca. 1.5-fold. Even more effective were complexes of the type  $\text{CpMo(CO)}_2\text{LX}$  ( $\text{L} = \text{PPh}_3, \text{AsPh}_3$  or  $\text{SbPh}_3$ ;  $\text{X} = \text{Cl, Br}$  or  $\text{I}$ ). With stibine complexes IPBH conversion was virtually complete, while the yield of propylene oxide approaches 80%. Furthermore, the rate of active complex decomposition was strongly dependent on L, with the highest rate seen with  $\text{PPh}_3$  and the slowest with  $\text{AsPh}_3$ . Figures 1; references 17: 9 Russian, 8 Western.  
[227-12172]

## GENERAL BASE CATALYSIS IN AMMONOLYSIS OF 1-HALOANTHRAQUINONES ON Cu(I) COMPOUNDS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 12 Mar 84) pp 84-88

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[Abstract] In ammonolysis of haloanthraquinones catalyzed by copper compounds, ammonia functions both as a reactant as well as a base catalyst. To further define its role, as well as that of the halogen atom in 1-haloanthraquinone, an analysis was performed on the kinetics of ammonolysis of 1-chloro- and 1-bromoanthraquinones in 50% aqueous solutions of dioxane or pyridine catalyzed by Cu(I) acetate and the bases ammonia, pyridine and calcium hydroxide. The process was determined to be first order in Cu(I) and fractional for the substrate and the reagent in the case of both substrates, which implies that ammonolysis of the 1-bromo- and 1-chloroanthraquinone involves analogous mechanisms. The rate of formation of the substrate-copper-reagent complex in dioxane was 1.5- to 5-fold greater than the rate constant for transformation into 1-aminoanthraquinone, indicating that the reaction can involve either direct substitution or general base catalysis. Calcium hydroxide and pyridine exhibited general base catalysis, with the latter also functioning as a ligand to activate the copper compound. The rate constant for the formation of the catalytic complex and the initial reaction were equivalent in the presence of a base. Figures 3; references 6 (Russian).  
[227-12172]

## HETEROGENOUS CATALYSTS OF HYDROGENATION OF GASEOUS ACETONE. PART 1. PREPARATION OF SUPPORTED METALLIC CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 1 Dec 83) pp 108-114

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[Abstract] Since carrier-supported metallic catalysts can achieve 100% selectivity in the hydrogenation of gaseous acetone to alcohol, a detailed study was conducted on the method employed in the preparation of such catalysts. Derivatographic, mass spectrometric and thermogravimetric techniques were utilized to monitor and assess treatment of  $\gamma\text{-Al}_2\text{O}_3$  support

phase with Fe(III), Ni(II), Co(II) and Cu(II) nitrates, subsequent thermal decomposition, and reduction of the resultant oxides. During nitrate decomposition at 723°K for 5 h, crystalline oxides were formed, with subsequent reduction plots represented by saturation curves. The energies of activation for the reductive process were in the 7 to 28 kJ/mole range, and led to the identification of the following arrangement in terms of susceptibility to reduction:  $\text{Fe}_2\text{O}_3 < \text{CoO} < \text{NiO} < \text{CuO}$ . Figures 3; references 13: 11 Russian, 2 Western.  
[227-12172]

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HETEROGENOUS CATALYSIS OF HYDROGENATION OF GASEOUS ACETONE. PART 2.  
KINETICS AND REACTION MECHANISM ON IRON SUBGROUP SUPPORTED CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 1 Nov 83) pp 115-120

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[Abstract] Studies were conducted on the kinetics and mechanisms of acetone hydrogenation to isopropanol at 333-363°K over Fe, Ni and Co catalysts on  $\gamma\text{-Al}_2\text{O}_3$  support. Both the Ni and Co catalyst showed high activity and 100% selectivity, while the Fe catalyst was inactive. Determinations of adsorptions on the active catalytic sites and IR spectroscopy demonstrated that the limiting step in the process was the reaction of adsorbed acetone with atomic hydrogen. An acyl structure of the  $(\text{CH}_3)\text{C}=\text{O}\cdots\text{Me}$  type was formed at the surface of the catalysts, based on absorption in the 1605-1590  $\text{cm}^{-1}$  band. In addition, on the Fe catalyst an absorption band was identified at 1650  $\text{cm}^{-1}$ , which can be ascribed to an alkoxy group --  $(\text{CH}_3)\text{C}=\text{O}-\text{Me}$  -- in which the molecular orbital of the CO group overlaps with the free d-orbital of Fe. Under these conditions the Fe-C bond becomes stronger and the C=O bond weaker, accounting for the much firmer binding of acetone to the Fe catalyst and, hence the inactivity of the Fe catalyst in this reaction. Figures 3; references 15: 11 Russian, 4 Western.  
[277-12172]

MECHANISMS OF CARBON MONOXIDE OXIDATION ON SUPPORTED METALLIC CATALYSTS.  
PART 1. LOW-TEMPERATURE OXIDATION OF CARBON MONOXIDE ON Pd/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 22 Dec 83) pp 134-140

KAKHNIASHVILI, G. N., MISHCHENKO, Yu. A., DULIN, D. A., ISAYEVA, Ye. G. and  
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[Abstract] The mechanism of low-temperature ( $\leq 150^\circ\text{C}$ ) oxidation of carbon monoxide over Pd/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> was studied, employing thermal desorption analysis and <sup>18</sup>O label. The reaction was determined to proceed via reaction of CO molecules with hydroxyl groups of Al<sub>2</sub>O<sub>3</sub> in the intermediate complexes, and was first order in CO and zero order in oxygen. A fusion mechanism was advanced for the reaction, involving formation and decomposition of carboxyl structures. In the proposed mechanism, adsorbed oxygen re-oxidizes reduced Pd atoms and leads to the formation of CO<sub>2</sub> from the carboxyl structures, concomitantly with regeneration of hydroxyl groups. Figures 1; references 18: 15 Russian, 3 Western.  
[277-12172]

INTERACTION OF REACTANTS WITH SURFACE OF METAL OXIDE CATALYSTS DURING  
OXIDATIVE AMMONOLYSIS OF TOLUENE

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 26 Jan 84) pp 146-150

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[Abstract] Pulsed delivery of reactants was used to study separate and combined interaction of toluene, oxygen and ammonia with the surface of a multimetallic oxide catalyst under steady-state and nonsteady-state conditions. The catalyst used for the oxidative ammonolysis of toluene was a mixture of bismuth, antimony and vanadium oxides on  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>. Benzonitrile formation under steady-state conditions involved a step-wise oxidation and reduction mechanism, while complete oxidation involved both step-wise and associative mechanisms. The steps of benzonitrile formation consisted of reaction of toluene and ammonia with surface oxygen of the catalyst, and subsequent oxidation of the reduced surface by oxygen in the gas phase. Figures 3; references 8: 7 Russian, 1 Western.  
[277-12172]



EFFECTS OF GRANULATION CONDITIONS ON POROSITY AND MECHANICAL STRENGTH OF MULTICOMPONENT CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 3 Jan 84) pp 216-221

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[Abstract] The porosity and mechanical strength of Bi-Mo catalysts was evaluated in relation to conditions of granulation. The extrusion catalysts contained admixtures of Fe, Co, Ni, Cd, K and P, and were supported on silica gel. Mixing of the oxide powders with water resulted in disaggregation of the grains, yielding relatively stable granules with fairly uniform pores. The mechanical strength of the granules was further enhanced by sintering. The use of silica sols as a binding agent resulted in an increase in the specific surface area of the catalysts and reduced the mean pore radius, as well as resulting in a further improvement in the mechanical strength. Figures 3; references 10: 5 Russian, 5 Western.  
[277-12172]

ISOMERIZATION OF n-HEXANE ON Pd-ZEOLITE CATALYSTS CONTAINING RARE EARTH AND TRANSITIONAL ELEMENTS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 27 May 83) pp 236-237

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[Abstract] An evaluation was conducted on the contribution of rare earths and transition elements on the activity and selectivity of Pd-zeolite catalysts in n-hexane isomerization at 280-350°C. On Pd catalysts with Ca cations the isohexane yield is ca. 58% at 350°C, whereas on catalysts with rare earth and transitional element cations a yield of 60-71% is attained at 320-330°C. Furthermore, best Pd-zeolyte catalysts consisted of those containing Ca and rare earth cations, yielding a maximum yield of isohexanes of 71% with a 95% selectivity. The effectiveness of the latter catalysts was due to the fact that replacement of ca. 5% of the Ca cations with rare earth cations increased the number of acid sites. Figures 2; references 7 (Russian).  
[277-12172]

ISOTOPE EXCHANGE METHOD IN STUDIES ON n-PENTANE ISOMERIZATION ON Pt-Pb AND Pt-Cu CATALYSTS ON  $\gamma$ - $\text{Al}_2\text{O}_3$ 

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 9 Jan 84) pp 238-241

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[Abstract] Isotope exchange (deuterium) techniques were employed to assess-pentane isomerization on Pt-Pb and Pt-Cu catalysts on  $\gamma$ - $\text{Al}_2\text{O}_3$  support, since it has previously been reported that addition of 25% Pb to Pt catalysts inhibits hydrogenolysis without affecting isomerization. The kinetic data showed that in the 400-450°C range the rate of hydrogen-deuterium exchange markedly exceeds the rate of isomerization, and that the concentrations of deuterium are much higher in the product (isopentane) than in n-pentane. Evidently, transformation of n-pentane involves ingress of additional deuterium into the molecule, indicating that hydrogen is an indispensable component of isomerization. These observations indicate that the adsorption-desorption stages in isomerization are very fast reactions. References 8: 7 Russian, 1 Western.  
[277-12172]

SYNTHESIS OF HYDROCARBONS FROM CO AND  $\text{H}_2$  ON  $\text{Os}_3(\text{CO})_{12}/\text{Al}_2\text{O}_3$  CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 17 Jan 84) pp 248-252

LAPIDUS, A. L., SAVEL'YEV, M. M., MURANOVA, L. M., KONDRAT'YEV, L. T. and SOMINSKIY, S. D., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract]  $\text{Os}_3(\text{CO})_{12}/\text{Al}_2\text{O}_3$  catalysts containing different concentrations of K were evaluated for their effectiveness in promoting hydrocarbon synthesis from carbon monoxide and hydrogen at 250-350°C and atmospheric pressure. Highest activity was exhibited by catalysts supplemented with 1.1 or 3.2% K, leading to the synthesis of  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_8$ ,  $\text{C}_3\text{H}_6$  and  $\text{C}_4\text{H}_{10}$ . Figures 2; references 7: 1 Russian, 6 Western.  
[227-12172]

## DISTORTION OF NATURAL GRAPHITE PROCESSED WITH SULFURIC ACID

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 85  
(manuscript received 28 Nov 84) pp 3-6

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[Abstract] Modern chemical technology requires lightweight construction materials that withstand high temperatures and corrosive environments. Graphite and graphite-based materials offer promise for such applications, but more durable bonds of the carbon in graphite with other substances, such as sulfuric acid, must be developed to provide needed operational qualities. The present article reports on studies, at the Gas Institute, of oxidation of graphite and resultant distortion during heating in an air flow. The processes of scaling and dissolution in water, then reconsolidation, are summarized. Results showed that as concentrations of potassium bichromate surpassed 2%, and those of ammonium persulfate exceeded 4%, little change in density was noted. When graphite was oxidized with added potassium bichromate and distorted at 800°C, less oxidant was required to obtain the same density. Time was not a factor in the results. Other details of scale configuration and physical properties are summarized. Adsorption tests were also conducted. The expanded graphite had density of 7-12 g/l, 0.8% sulfur and 40% of the moisture of the initial composition. Test bearings and packings with added resin as a bonding agent had the desired service characteristics. Figures 5; references 7 (Russian).  
[231-12131]

## CATALYST FOR ISOMERIZATION OF CYCLOHEXANONOXIME FORMED IN ULTRASOUND FILM

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 85  
(manuscript received 18 Jun 84) pp 8-11

ROMENSKIY, A. V., SUKHINA, N. K., POPIK, I. V., LOBOYKO, A. Ya. and  
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[Abstract] Isomerization of cyclohexanone oxime is a key stage in producing caprolactam. Currently oleum or sulfuric acid, which are in short supply, are used in the process; the ammonium sulfate by-product is of little value as a fertilizer. The present study reports on preparation of catalysts based on boric acid which are highly selective in isomerization and which convert the initial product completely. The catalysts were prepared in an ultrasound field with a GIAP-2 20% aqueous solution of boric acid, followed by calcination. The ultrasound equipment is diagrammed and described. The preferred catalyst, with a soot:boric acid:aluminum oxide ratio of 1:4:5,

had the best porosity and phase composition. Its effectiveness and useful life were studied carefully. Results indicated that no physicochemical properties were lost in regeneration; the catalyst had the hardness of corundum due to the formation of  $9\text{Al}_2\text{O}_3 \cdot 2\text{B}_2\text{O}_3$  during its formation, and it could be used for isomerization of cyclohexanone oxime in a moving catalyst set-up. Figure 1; references 2 (Russian).  
[231-12131]

UDC 541.128.13

#### USE OF GALVANIZED PRODUCTION WASTES AS RAW MATERIAL FOR PRODUCING CHROMIUM-COPPER CATALYSTS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 85  
(manuscript received 25 Mar 84) pp 11-13

AFONSKIY, S. S., TERESHCHENKO, A. D., GUBSKAYA, Ye. S. and VLASENKO, V. M.,  
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[Abstract] In modern production of galvanized products, liquid wastes with various useful chemicals are discharged; these have been studied as dyes and binders. The present article reports on study of production of chromium-copper catalysts from wastes of copper etching and related alloys. The authors studied the effectiveness of chromium-copper contacts obtained from galvanization waste products in oxidation of carbon and methane, as well as the effects of sulfur dioxide in their activity. Tests were conducted at 400, 700 and 900°C. Comparison of such catalysts produced from wastes and those produced using pure salts showed no difference in the reaction that could be attributed to the source of the chemicals used in production. Increased temperature was found to reduce surface and therefore, effectiveness. Study of oxidation showed that the presence of copper or chromium sulfates had no effect on catalyst activity when they were used for oxidizing methane, but reduced effectiveness when carbon monoxide was being oxidized. The presence of sulfur dioxide reduced activity in both reactions, but no particular difference between catalysts made from pure chemicals and those made from waste products of galvanization was noted. Figures 3; references 8: 6 Russian, 2 Western.  
[231-12131]

## BLOCK CARRIERS OF OXIDE AND PALLADIUM CATALYSTS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 85  
(manuscript received 20 Apr 84) pp 37-39

TERESHCHENKO, A. D., SHEVEL', A. A. and VESELOV, V. V., Gas Institute,  
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[Abstract] Cobalt oxide and copper chromite have been identified as highly promising catalysts for purifying industrial and automobile waste gases. The present article reports on study of block polymers with a honeycomb structure, which have low gas dynamic resistance, high mechanical durability, thermal durability to 1200°C and maximum catalytic surface availability. Study of the effects of the carrier properties on activity was carried out on ceramic samples processed at 900, 1100, 1200 and 1400°C, with 2.4 X 2.4 mm cells. Results indicated that the honeycomb block treated at 1200°C had the greatest mechanical durability, and had sufficient moisture capacity for application to purifying exhaust gasses from internal combustion engines. Low-density (0.02% Pd) palladium and typical (5% active material) oxide catalysts were prepared. Subsequent study of catalytic oxidation of carbon monoxide showed no significant changes in catalytic activity due to changes caused by various heat treatment temperatures (900-1400°C) with oxides, but with copper chromite, higher temperatures produced more effective catalysts. Little variation was noted with palladium catalysts. The tested block carriers were regarded as particularly promising for use in purifying exhaust gasses from internal combustion engines; they were less effective in reducing nitrogen oxide, unless cobalt was included in the catalyst. Figures 5; 1 table; references 5: 4 Russian, 1 Western.  
[231-12131]

UDC 541.138.546.77

## VAPOR-PHASE OXIDATION OF SELECTED ALIPHATIC ALCOHOLS ON Sn-Mo OXIDE CATALYST

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 34-36

KULAYMI, S., ALIYEV, E. A. and ADZHAMOV, K. Yu., Azerbaijan Institute of  
Petroleum and Chemistry imeni M. Azizbekov

[Abstract] An analysis was conducted on the efficiency of Sn-Mo oxide catalyst in promoting oxidation of several C<sub>1</sub>-C<sub>4</sub> alcohols under identical conditions, involving alcohol:air:water vapor ratio of 1:12:13. Comparison of the rate of aldehyde formation with CO<sub>2</sub> accumulation for the different alcohols (methanol, ethanol, n-propanol, isopropanol, butanol) revealed a symbatic relationship, indicating that identical mechanisms were involved in each case. Comparative assessment of the rate of aldehyde synthesis with

conversions of less than 20% led to the following ranking of reactivity of the alcohols: n-propanol>ethanol>methanol>n-butanol. This ranking was predicated on steric factors affecting the location of the hydroxyl groups and changes in the active surface of the Sn-Mo catalysts. Figures 2; references 6 (Russian).  
[235-12172]

UDC 54342+543.544.45

#### ALKYLATION OF DIPHENYL BY 1-OCTENE ON $\text{Al-CCl}_4$ CATALYST

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 50-54

ALIYEVA, A. R., SEIDOV, N. M., KYAZIMOV, S. M., BURDZHALIYEV, D. A.,  
ZAIDOVA, R. R., POGORELOV, A. G. and YANCHESSKAYA, T. V., Azerbaijan  
Institute of National Economy imeni D. Buniatzade

[Abstract] Mathematical modeling was employed to determine optimal conditions for alkylation of diphenyl by 1-octene on  $\text{Al-CCl}_4$ . The experimental conditions involved temperatures of 20 to 100°C and reaction times of 20-60 min. The alkylated products were fractionated under vacuum, with analysis showing that fraction I (40-370°C) contained maximal monoctyldiphenyl yield of 47.11%, with a selectivity of 91.9% and 57.9% conversion. The optimum conditions for the preparation of fraction II (370-420°C) consisted of a reaction temperature of 40-45°C and a reaction time of 60 min, and a diphenyl conversion of 99.5%. Monoctyldiphenyls with a MW of 266 predominated in fractions I and II, while in fraction III (420-480°C) dioctylphenyls predominated (68%). Trioctyldiphenyls were present in about equivalent quantities in fraction II (11.3%) and III (11.8%). Penta- and tetra-substituted diphenyls were present in insignificant concentrations in fraction III (0.25 and 1.85%, respectively). References 3 (Russian).  
[235-12172]

UDC 541.128

#### HYDROGENATION OF NITRO COMPOUNDS ON NICKEL MEMBRANES

Moscow ZHURNAL FIZICHESKOY KHMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 13 May 83) pp 609-612

SOKOL'SKIY, D. V., NOGERBEKOV, B. Yu., GUDELEVA, N. N. and MUSTAFINA, R. G.,  
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Sciences, Alma Ata

[Abstract] Hydrogenation of sodium p-nitrophenolate was studied on nickel membranes in 0.1 N NaOH solution under different conditions of electrochemical

production of hydrogen in temperature range 20-60°C. The reduction process goes all the way to the final products; no intermediate products such as sodium p-nitrosophenolate or p-hydroxylaminophenolate were isolated. The yield of the final product depended on the conditions of hydrogen production on the polarization side of the membrane: potential, polarizing current strength and temperature. Figure 1; references 11: 9 Russian (1 by Western author), 2 Western.  
[248-7813]

UDC 541.128.13

#### USE OF TAGGED NITROGEN FOR DETERMINATION OF $\text{NH}_3$ AND NO REACTION STAGES ON PLATINUM

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 9 Sep 83) pp 707-710

NIKITUSHINA, L. M. and KUCHAYEV, V. L., Scientific Physical-Chemical Research Institute imeni L. Ya. Karpov, Moscow

[Abstract] Reaction of  $\text{NH}_3$  with NO over platinum at high temperatures occurs by the equation  $4\text{NH}_3 + 6\text{NO} = 5\text{N}_2 + 6\text{H}_2\text{O}$ .  $\text{NO}_2$  does not form under these conditions. Distribution of  $^{15}\text{N}$  was studied in this reaction using  $^{14}\text{NO}$  and  $^{15}\text{NH}_3$  tagged reagents, 430°C and about 1 mPa pressure. The following mechanism was proposed for this reaction: nitrogen oxide adsorbs reversibly with dissociation to atoms. Ammonia is also adsorbed reversibly.  $\text{NH}_3$  reacts with O (ads) forming N (ads) and  $\text{H}_2\text{O}$ . One of the stages in which H is split off the  $\text{NH}_3$  on the surface should be irreversible. Reaction of two N (ads) leads to isolation of  $\text{N}_2$  on the surface of the molecule and the reaction of N (ads) with O (ads) -- to desorption of NO. With such a mechanism nitrogen isotopes in the  $\text{N}_2$  should be randomized; desorbed N and NO should have identical N isotope composition and the isotope composition of desorbed  $\text{NH}_3$  should be the same as in the adsorbed  $\text{NH}_3$ . Figure 1; references 8: 4 Russian, 4 Western.  
[248-7813]

UDC 546.47.221:541.183.26

#### ADSORPTION PROPERTIES OF SOLID SOLUTIONS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 17 Oct 83) pp 711-714

KOCHURIKHIN, V. Ye. and REVENOK, T. V., Moscow Chemical-Technologic Institute imeni D. I. Mendeleev

[Abstract] Solid solutions of zinc and cadmium chalcogenides are widely used in electronic technology. In the present paper argon adsorption was

used to study surface properties of solid solutions of ZnS-ZnSe in pressure range of  $10^{-3}$  to  $2 \times 10^4$  Pa and 77.4 K. Argon adsorption is not sensitive to chemical composition of the surface but depends on its structural characteristics. Experimental data showed that in relative pressure range of 0.02--0.7, argon adsorption on all samples of ZnS-ZnSe was identical. At pressures below 0.2 Pa the  $V/V_m$  expressed as a function of P depended on the content of ZnSe. In respect to their adsorptive ability, the study materials could be divided into three groups: ZnS with maximum adsorption surface, solid solution ZnS-ZnSe with 5-50% of ZnSe and solid solutions with more than 70% ZnSe. An assumption was made that the reaction of solid solutions ZnS-ZnSe with surrounding gas medium may be determined by concentration of centers with highest adsorption energy, which in turn determines thermal and chemical stability of solid solutions. The most stable are solid solutions with 70%+ content of ZnSe. Figures 2; references 15: 8 Russian (1 by Western author), 7 Western.  
[248-7813]

UDC 541.64+547.313.2

#### ETHYLENE POLYMERIZATION OVER $Al(C_2H_5)_2Cl-VOCl_3$ MODIFIED BY $CCl_4$

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 2, Mar-Apr 85 (manuscript received 5 Jun 84) pp 28-33

ZHUBANOV, B. A., BELEKHOV, S. A., FAVORSKAYA, M. V. and ZAVOROKHIN, N. D.,  
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[Abstract] To further improve the efficiency of  $Al(C_2H_5)_2Cl-VOCl_3$  catalysts in ethylene polymerization, the catalytic parameters of the process in heptane were monitored in relation to the addition of  $CCl_4$ . Addition of small quantities of  $CCl_4$  (0.2-0.5% of reaction volume) improved both stability and catalytic efficiency. Optimal relationships of the components of the modified catalyst were determined as  $Al/V = 20-25$ ,  $Al/D = 1.0-1.5$ ,  $D/V = 15-25$ , and  $CCl_4/V = 25-50$ , yielding a maximum synthesis of polyethylene of 35 kg/gV·h·atm at 60°C. Under those conditions the concentration of active centers was estimated at  $2.2 \times 10^{-2}$  moles/moles  $VOCl_3$ , representing 2.2% of the  $VOCl_3$  component, with a concomitant rate constant of 10,400 liters/mole·sec. Figures 2; references 17: 13 Russian, 4 Western.  
[261-12172]



## MECHANISM OF OXIDATIVE AMMONOLYSIS OF TOLUENE OVER V-Ti OXIDE CATALYST

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 2, Mar-Apr 85 (manuscript received 5 May 82) pp 51-58

BUKEYKHANOV, N. R., SUVOROV, B. V. and DZHUSUPOV, B. T., Order of the  
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[Abstract] In order to define the mechanism of oxidative ammonolysis of toluene, the kinetics of the process were studied over a  $V_2O_5$ - $TiO_2$  (V:Ti = 1:0.5) catalyst in relation to the nitrogen donor. The nitrogen donors can be divided into two broad groups, one of which consists of hydrazine and alkylamines and other compounds that can be regarded as derivatives of ammonia that can react with partially oxidized toluene. The other group represents nitrogenous compounds that can serve as donors only after degradation to low MW fragments, such as acetonitrile, pyridine, and nitrobenzene. Analysis of the various reaction mechanisms demonstrated that partial oxidation leads to formation of aldehydes and acids. Under optimal conditions, i. e., with an excess of oxygen, ammonia, and water, the overall process of the combined heterogeneous and homogeneous catalysts the primary routes involve aldehyde and acid, with benzamide serving as the primary precursor of benzonitrile. The amine route was quite insignificant and prominent only in oxygen deficiency, which also diminished toluene conversion. Figures 2; references 17: 12 Russian, 5 Western.  
[261-12172]

UDC 543.87:66.094.37:(547.53+546.171.1)

## REACTIVITY OF SELECTED ALKYL BENZENES IN OXIDATIVE AMMONOLYSIS OVER V-Ti CATALYSTS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 2, Mar-Apr 85 (manuscript received 4 Jan 83) pp 58-63

BUKEYKHANOV, N. R., VOROB'YEV, P. B., SUVOROV, B. V., LYUBARSKIY, A. G.,  
GORELIK, A. G., ZULKASHEVA, A. S., GABDULLINA, L. F., IVANOV, Ye. V. and  
STEPANOVA, L. A., Order of the Red Banner of Labor Institute of Chemical  
Sciences, Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] The reactivity of 15 alkylbenzenes was evaluated in oxidative ammonolysis over V-Ti oxide catalyst at 380°C in terms of their reaction rates. The resultant kinetic and PMR data on the chemical shift in  $CH_3$  protons and relative basicity of the hydrocarbons in question are presented in a tabular form. Analysis of the data demonstrated that in the toluene--pseudocumene--mesitylene series a direct correlation prevails between the increase in the rate constant and basicity. The kinetic data

also indicated that the chemical shift in the  $\text{CH}_3$  protons does not constitute the determining factor in the rate of ammonolysis, since both electron donor and electron acceptor substituents facilitated a rate increase. This was equally applicable to the o- and p-derivatives in which conjugation effects are of prime importance, as well as to the m-derivatives in which inductive effects of the substituent predominate. References 21: 16 Russian, 5 Western. [261-12172]

## COAL GASIFICATION

UDC 541.15:552.57

### KINETICS OF GAS FORMATION DURING RADIOLYSIS OF LIGNITE AND CRUDE OIL RESIDUES

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 26 Dec 83) pp 184-185

MUSTAFAYEV, I. I., BAKIROV, M. Ya., YAKUBOV, K. M. and GADZHIYEV, Kh. M.,  
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[Abstract] The radio-chemical output of hydrogen, carbon monoxide, and methane is tabulated for lignites from three locations and several crude oil residues such as asphalt. Samples were vacuum processed to remove moisture and occluded gases and then subjected to gamma radiation at room temperature. Hydrogen formation varied linearly with dose, but was relatively low for all the lignites which proved to be resistant to radiolysis. The crude oil residues gave significantly higher yields of hydrogen and methane, though somewhat less carbon monoxide. This is apparently due to their relatively high hydrogen content, their lower degree of carbon bonding, and their lower oxygen content. Figure 1; references 3 (Russian).  
[251-12672]

UDC 541.118:662.65

### THERMODYNAMIC ANALYSIS OF PLASMO-CHEMICAL PROCESSING OF COAL

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 2 Mar 84) pp 160-163

MESSERLE, V. Ye., SAKIPOV, Z. B., SINYAREV, G. B. and TRUSOV, B. G.,  
Kazakh Scientific Research Institute of Energetics

[Abstract] Computerized analysis using a standard ASTRA-2 program of thermodynamic balances was used to determine the optimal scheme of processing low-grade coal, considering exploitation of both the organic and mineral content. Using data on lignite from the Turgayskiy Basin and a carbon:oxygen ration of 0.75, at temperatures less than 2000°K the organic phase was 99% synthesis gas. Nitrogen oxides were almost totally absent. Sulfur was

present almost totally as hydrogen sulfide, carbon disulfide, or elementary sulfur, depending on the temperature interval, with transition temperatures of 1875°K and 3950°K respectively. Likewise, above 3100°K, all mineral oxides are reduced to elements, specifically including Si, Al, Fe, Ca, Mg and Ti, which can be recovered. Figures 3; references 6 (Russian).  
[251-12672]

TWO COMBUSTION ZONES IN LOW-TEMPERATURE SOLID PHASE REACTIONS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 8 Dec 83) pp 409-414

BENDERSKIY, V. A., MISOCHKO, Ye. Ya. and FILIPPOV, P. G., Chernogolovka  
Section, Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Study of solid phase chlorination of saturated hydrocarbons below 60 K showed a maximum limit for combustion to be correlated to the concentration of radicals, and further study developed a hierarchy of values. The present article reports on measurements of critical concentrations of  $R_{cr}$  radicals and shows that for a "deformation" explosion that concentration is higher by an order than for thermal explosion, and that a spontaneous transition occurs from the first to the second. The authors studied methylcyclohexane with a glass point below 100 K in a ratio with chlorine of 2 : 1. The mixture was prepared at 180 K, then cooled rapidly to 5 K for glassing. Electron spin resonance was used to determine the number of radicals. Photolysis and explosion during its constant maintenance are described. Results showed the gradual acceleration of chain breakdown in a narrow temperature band near 100 K, i.e., 10-15 K above the glass point. While the low-temperature flash point was unrelated to temperature, a second point of combustion related to the rate of relaxation of mechanical tension grew with increasing temperature, and high-temperature thermal explosion was determined by a competition between temperature parameters of the rate of growth and chain break-down with high initial concentrations of radicals. Figures 3; references 12: 11 Russian, 1 Western.  
[234-12131]

## SPREAD OF LAMINARY FLAME IN HYDROGEN-AIR SYSTEM AT HIGH TEMPERATURES AND PRESSURES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 83  
(manuscript received 13 Oct 83) pp 421-424

BASEVICH, V. Ya. and BELYAYEV, A. A., Institute of Chemical Physics,  
USSR Academy of Sciences, Moscow

[Abstract] In assessing hydrogen as a potential fuel, preliminary consideration must be made of combustion parameters. Little research has been done so far on the subject. The present article reports on study of the rate of spread of a hydrogen-air flame, in a mixture of 29.3% H<sub>2</sub>, 14.7% O<sub>2</sub> and 56% N<sub>2</sub>, at temperatures up to 600 K and pressures up to 100 bar. Formation of NO during combustion was found to occur in the combustion front and in reaction products, but most formed in the reaction and that forming at the combustion front was related to processes occurring between the time of the reaction and emission into the atmosphere. Figures 2; table 1; references 8: 6 Russian, 2 Western.  
[234-12131]

UDC 678.046.83:678.743.22

## ANTISTATIC PVC MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 21-22

SHEVERDYAYEV, O. N.

[Abstract] Antistatic properties of PVC were studied as a function of chemical structure of surfactants (SA). The most effective antistatic reagents were hydroxyethylated laurylamine, monoethanol amide of SZhK (unknown abbreviation) and 1-hydroxyethyl-2-heptadecylimidazoline. The hydrophilicity and antistatic properties of the polymer are related to chemical structure of SA. Antistatic properties of PVC depend on the length of the amine hydrocarbon radical. Therefore, nonionogenic SA should be used as antistatic agents. The results obtained made it possible to classify nonionogenic and ionogenic SA by their effectiveness as antistatic reagents for PVC, considering the type of heteroatoms involved, the degree of hydroxyethylation of SA and the length of hydrocarbon radical.  
References 2 (Russian).  
[250-7813]

UDC 541.127:537.568:541.14

EFFECTS OF ILLUMINATION ON RATE OF SURFACE RECOMBINATION OF ATOMIC PARTICLES

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 1, Jan-Feb 85  
(manuscript received 21 Nov 83) pp 51-55

SUKHAREV, V. Ya. and MYASNIKOV, I. A., Physicochemical Scientific  
Research Institute imeni L. Ya. Karpov, Moscow

[Abstract] Theoretical consideration is given to the effect of light on the rate of atomic particle recombination on the surface of oxides with semiconductor properties. Analysis of the various factors in mathematical terms demonstrates that one of the key parameters in this process is the concentration of photodefects in the field of illumination, which differ in their energetics and lifetimes. Basically, the rate of heterogenous recombination is based on acceleration of migration of surface atoms by the electrostatic fields of the defects. Comparison with experimental data on coefficients of heterogenous recombinations showed good agreement between the theoretical considerations and changes in the coefficient encountered on catalyst illumination. References 14: 12 Russian, 2 Western.  
[227-12172]

POTENTIAL CURVES OF LiHe MOLECULES AND EFFECTIVENESS OF EXCITATION OF CHARGE LEVEL IN Li-He MIXTURE

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 13 Dec 83) pp 317-320

NEMUKHIN, A. V. and PEVGOV, V. G., Chemistry Faculty, Moscow State  
University imeni M. V. Lomonosov

[Abstract] Eximer molecules containing metal atoms, such as LiHe, are receiving interest in laser research. The present article reports on study of potential curves and possible electron excitation of the LiHe molecule under an electrical charge. Four dissociation extremes of the LiHe system correlated to adiabatic states were studied by a method of multiple configuration of a self-regulated field (MCSRF). Problems of calculation,

such as the difficulty in choosing base values, are discussed. The calculated potential curves showed that the LiHe molecule is a likely candidate for eximer laser development, since it has an unbonded basic state, while excitational zone are in bonded states. The electron balance in the electrical charge plasma, where Li:He=1:1000, is also a favorable indicator of the molecule's laser potential. Figures 2; references 20: 4 Russian, 16 Western.  
[234-12131]

UDC 541.138

#### SINGLE-STEP ELECTROCHEMICAL SYNTHESIS OF BENZYL ALCOHOL FROM BENZONITRILE

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 37-40

AGAYEV, U. Kh., GUSEYNOV, I. A., RIZAYEVA, S. Z., ABDULLAYEVA, T. M., RZAYEV, R. G. and ALYYEV, A. T., Institute of Organochlorine Synthesis, Azerbaijani SSR Academy of Sciences

[Abstract] A single-step electrochemical process was devised for the synthesis of benzyl alcohol from benzonitrile, using Raney nickel industrial catalyst and consisting of a mixed reaction mechanism. The initial chemical step involved the formation of benzoic acid on reaction of benzonitrile with hydrochloric acid in aqueous solution. In the second step of the mixed process, the benzoic acid is reduced to benzyl alcohol. Electrochemical conditions leading to maximal benzyl alcohol yields are defined. Figures 2; references 10: 8 Russian, 2 Western.  
[235-12172]

UDC 541.13:541.183.12

#### ELECTROLYTE TRANSPORT IN COMMERCIAL BIPOLAR MEMBRANES USING CHRONOPOTENTIOMETRY METHOD

Moscow ELEKTROKIMIYA in Russian Vol 21, No 2, Feb 85  
(manuscript received 10 Sep 82; after revision, 7 Jun 83) pp 152-156

SHEL'DESHOV, N. V., GNUSIN, N. P., ZABOLOTSKIY, V. I. and PIS'MENSKAYA, N. D., Kuban State University, Krasnodar

[Abstract] An attempt was made to improve the previously used model for the description of relationship between transition time and current density by including the consideration of the thickness of bipolar membranes. Theoretical results were compared with data obtained in a wide range of transition times using commercially available bipolar membranes (MB-1, MB-2 and MB-3). Diffusion of NaCl was determined by the method of chronopotentiometry. Data calculated from the model agreed well with experimental results. In the area of short transition times all membranes showed divergence between



experimental and model data which could be due to two factors: a) increased diffusion coefficient of the electrolyte in the membrane due to heating of the bipolar area at high current density and b) inclusion of hydrogen and hydroxyl ions into migrational transfer in the proximity of bipolar juncture. Figures 4; references 10 (Russian, 2 by Western authors).  
[245-7813]

UDC 541.1355292-18:547.-128

ROLE OF BENZENE RING IN ADSORPTION OF AROMATIC COMPOUNDS ON PLATINUM ELECTRODE

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 2, Feb 85  
(manuscript received 4 Jul 83) pp 186-189

VASIL'YEV, Yu. B., MAKSIMOV, Kh. A. and GOROKHOVA, L. T., Institute of Electrochemistry, USSR Academy of Sciences, Moscow

[Abstract] Adsorption and electrochemical behavior of toluene (I), cyclohexene (II) and cyclohexane (III) on a platinum electrode was studied in an attempt to evaluate the role of substituents and benzene ring  $\pi$ -electrons in the adsorptional behavior of aromatic compounds. Basic principles of the adsorption of I, II, and III were determined by the method of complex potentiodynamic impulses over smooth platinum electrode in 0.1 N  $H_2SO_4$  solution. The data obtained showed that adsorption behavior of aromatic compounds is determined by interaction of benzene ring  $\pi$ -electrons with surface metal atoms. Depending on their nature and size, the substituents had some effect on the adsorption principally due to steric hindrance produced by them. Cyclohexane adsorption was accompanied by dehydration of the adsorbed molecule. Cyclohexene adsorbed as a result of  $\pi$ -electron interaction and because of dehydration of the adsorbed molecules. As a result of it, I, II, and III formed the same chemisorbed particle on the surface of the Pt electrode. Figures 4; references 9: 6 Russian, 3 Western.  
[245-7813]

## TRANSPORT PROCESSES IN ION-SELECTIVE MEMBRANE AND AT ITS JUNCTURE WITH ELECTRODE GLASS

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 2, Feb 85  
(manuscript received 8 Jul 83) pp 223-230

STEFANOVA, O. K., MANZHOS, A. P. and SHUL'TS, M. M., Leningrad State University imeni A. A. Zhdanov

[Abstract] In a previous paper, properties of a "combined" electrode were reported consisting of a glass electrode with a valinomycin containing membrane deposited on its surface. In present paper, results of potentiometric studies were reported looking for indications about processes occurring in this system primarily at the juncture between glass and polymer membrane. The membrane consisted of polyvinyl chloride plasticized with dibutylphthalate (DBP) and contained  $2.5 \times 10^{-3}$  mole/kg DBP of valinomycin. Several glass electrodes were used selective towards K, Na and H ions. After theoretical discussion of the system, experimental data of the dynamics of potentials in such a system obtained in contact with aqueous solutions of electrolytes led to conclusions about the relationships between various ionic diffusion streams in its individual segments. It was concluded that this method is economical and suitable for obtaining qualitative concepts as well as comparative data on the rate of these processes in various media. Figures 2; references 11 (Russian).  
[245-7813]

UDC 541.15:621.315.592

## CERAMIC PHOTO-ANODES FROM RUTILE ALLOYED WITH CHROMIUM

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 2, Feb 85  
(manuscript received 25 Jul 83) pp 261-265

SARKISYAN, A. G., ARUTYUNYAN, V. M., STEPANYAN, G. M., POGOSYAN, A. A. and KHACHATURYAN, E. A., Yerevan State University

[Abstract] Systematic investigation of the effect of chromium on electro-physical and photoelectrochemical properties of rutile electrodes could shed light on photoelectronic processes occurring at the junction of semiconductor/electrolyte due to generally lowered effectiveness of photo-anodes caused by alloying with chromium. In the present work rutile photo-anodes containing 0.1 to 2.5 at-% of chromium were studied. It was shown that increased concentration of chromium leads to elevated photosensitivity in long wave length range. Concurrently, the rate of surface recombination is increased and the potential of the beginning of anode photo current is shifted towards the positive values. Under such conditions, the contribution from long wave length photosensitivity does not compensate for the

negative effect of alloying. When chromium concentration is increased to 1 at-%, KPD (unknown abbreviation) of the photo anodes drops drastically and remains low. Figures 5; references 7: 4 Russian, 3 Western.  
[245-7813]

UDC 541.138.3

AUTO-OXIDATION OF PLATINUM REDUCED ON CATHODE WITH PARTICIPATION OF 'DEEP' OXYGEN

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 2, Feb 85  
(manuscript received 14 Jul 83) pp 256-260

CHETYRBOK, L. N., NAUMOV, V. I. and TYURIN, Yu. M., Gor'ki Polytechnic  
Institute imeni A. A. Zhdanov

[Abstract] Conditions for the formation and the nature of observed stationary potential of smooth platinum were discussed. At pH 7 this potential exceeded the value of reversible oxygen electrode in a similar solution, which appears at the cathode reduced electrode and is practically independent of pH. It was shown that this potential is supported by oxygen dissolved deep inside the platinum which diffuses towards the surface of the electrode under conditions assuring realization of stationary potentials of smooth platinum  $E_1^{oc}$  and  $E^{oc}$  where oc = open chain. Figures 6; references 16: 11 Russian (1 by Western<sup>II</sup> author), 5 Western.  
[245-7813]

UDC 541.15:541.413:546.16

COMPARISON OF OUTPUT OF STABLE PERFLUOROALKYL RADICALS FROM GAMMA AND  
NEUTRON RADIOLYSIS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 17 Sep 84) p 182

ALLAYAROV, S. R., BARKALOV, I. M., GOL'DANSKIY, V. I. and ZUYEV, A. P.,  
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[Abstract] Gamma irradiation with  $^{60}\text{Co}$  of perfluoro-1-methyl-4-isobutyl-cyclohexane formed stable perfluoroalkyl radicals at 300°K, with concentration dependent on dose. However, irradiation with 14 MeV neutrons did not produce stable radicals. Further investigation of these phenomena could serve to both elucidate the understanding of free radicals and develop a means of measuring gamma radiation against a background of fast neutrons. Figures 1; references 1 (Russian).  
[251-12672]

PROCESSES OF CHEMICAL PRODUCTION OF SILICON AND TITANIUM OXIDES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 23 May 83) pp 683-686

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[Abstract] The effect of principle thermodynamic factors such as temperature of the support, vapor pressure of reagents, etc., on the process of chemical accumulation of titanium and silicon oxide layers on the surface of gallium arsenide was studied. At relatively high final pressures ( $p > 10$  Pa) and low temperature it was shown that the growth of layers is achieved by reactions with physically adsorbed layer; at 450 K and relatively low pressure ( $p < 1$  Pa), the process of chemical accumulation occurs by molecular layering mechanism. Comparison of results obtained for the growth of Ti and Si oxide films showed that the growth of silicon oxide layers was very sensitive to technical parameters of the synthesis; the monolayer could only be obtained at  $p \sim 6$  Pa and  $T = 520$  to  $560$  K. Under both conditions studied, the reactivity of titanium and silicon chlorides differed substantially because of the differences in their electrophilicity. Figures 3; references 7: 6 Russian, 1 Western.  
[248-7813]

HYDROGEN REACTION WITH  $\gamma\text{-Al}_2\text{O}_3$  SURFACE UNDER CONDITIONS OF CHANGING HUMIDITY IN SYSTEM

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 23 May 83) pp 687-689

BORISEVICH, Yu. P., FOMICHEV, Yu. V. and LEVINTER, M. Ye., Kuybyshev  
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[Abstract] Reactions of  $\text{H}_2$  with the surface of  $\gamma\text{-Al}_2\text{O}_3$  under conditions of variable humidity in temperature range 873-1023 K were studied by a thermoprogrammed desorption method (TPDM). The depth of  $\gamma\text{-Al}_2\text{O}_3$  surface dehydroxylation under the influence of hydrogen was determined by the process temperature and by humidity of hydrogen; it could be viewed as a process of surface reduction, based on increased evolution of  $\text{H}_2\text{O}$  in  $\text{H}_2$  medium and 823--1023 K as compared to He medium at analogous temperatures. During a contact of  $\gamma\text{-Al}_2\text{O}_3$  dehydroxylated in  $\text{H}_2$  with water vapor contained in He, reinstitution of hydroxyl cover is observed accompanied by evolution of hydrogen, which may be viewed as oxidation of  $\gamma\text{-Al}_2\text{O}_3$  surface. Figures 2: references 10: 2 Russian, 8 Western.  
[248-7813]

UDC 546.26-162

## THERMOANALYTICAL STUDY OF LAMINAR GRAPHITE COMPOUNDS WITH TIN (IV) AND TITANIUM (IV) CHLORIDES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 3, Mar 85  
(manuscript received 11 Jul 83) pp 738-739

SOLOZHENKO, V. L., ARKHANGEL'SKIY, I. V., KOZLOVSKIY, V. F. and  
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imeni M. V. Lomonosov

[Abstract] Laminar graphite compounds with tin (IV) and titanium (IV) chlorides were studied by the method of differential scanning calorimetry. Thermoanalytical assay was performed on a microcolorimeter DSM-2 in temperature range 180--300 K and a heating rate of  $0.1^\circ/\text{s}$  under helium atmosphere. The study material had low values of enthalpy of decomposition indicating weak interaction between inserted chloride and the graphite lattice, agreeing well with results of Mossbauer studies of laminar graphite compounds with  $\text{SnCl}_4$ . References 4: 3 Russian, 1 Western.  
[248-7813]

## SYNTHESIS AND PHYSICOCHEMICAL PROPERTIES OF TERBIUM SELENIDES

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 3, Mar 85  
(manuscript received 20 Mar 84) pp 603-606

PRIBYL'SKAYA, N. Yu., ORLOVA, I. G., SHKABURA, O. N. and YELISEYEV, A. A.,  
Tyumen Industrial Institute imeni Lenin's Komsomol; Moscow Institute of  
Fine Chemical Technology imeni M. V. Lomonosov

[Abstract] The synthesis of terbium selenides was achieved by a previously described approach [Pribilskii, N. Yu., et al., Mat. Res. Bull., 17(9): 1147, 1982]. Analysis of the temperature factors and phase composition of the products demonstrated that formation of each of the three phases in Tb-Se interaction--TbSe, Tb<sub>2</sub>Se<sub>2</sub> -- involves TbSe<sub>2</sub> as an intermediate phase in solid-phase synthesis and in crystallization from the melt. The formation of terbium selenides follows the pattern established for the formation of terbium sulfides. Derivatographic and x-ray analysis data are summarized in graphic and tabular forms. Solid-phase synthesis of Tb<sub>2</sub>Se<sub>3</sub> required temperatures of 900-1000°C for 100-150 h. Higher temperatures in ampules led to loss of stoichiometry and formation of TbSe<sub>1.47-1.48</sub>; however, dissociation of Tb<sub>2</sub>Se<sub>3</sub> was prevented by Se vapors in the ampule on the order of 90 kPa. Figure 1; references 7: 4 Russian, 3 Western.  
[242-12172]

UDC 546.776'766'35'654-669

## RUBIDIUM AND LANTHANIDE CHROMATOMOLYBDATE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 3, Mar 85  
(manuscript received 23 Aug 83) pp 630-632

PROSKURYAKOVA, Ye. B., YEVDOKIMOV, A. A., FOMICHEV, V. V. and  
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imeni M. V. Lomonosov; Moscow Institute of Radiotechnology, Electronics  
and Automation

[Abstract] Thermogravimetric and x-ray phase analyses were conducted on the formation and polymorphism of rubidium and lanthanide chromatomolybdates under conditions of normal and elevated pressures within the 400-600°C temperature range. Firing at 400°C for 15 h resulted in a multiphase product, the primary phase being identified as RbLn(CrO<sub>4</sub>)<sub>0.5</sub>(MoO<sub>4</sub>)<sub>1.5</sub> and corresponding hydrates. Additional calcination at 500°C for 7 days and hardening in anhydrous vaseline oil yielded samples devoid of hydrates. Further heating at 600°C for 5 days led to the appearance of a LnCrO<sub>4</sub> phase, indicating limited degradation. Analysis of the effects of high pressure (40-60 kbar) exposures at 500°C for 5 min yielded structural data concordant with laws governing crystallization under high pressures.

The p-phases show minimal volume and maximal coordination number for the cations. In general, the overall polymorphism of rubidium and lanthanide chromatomolybdates at 400-600°C was similar to that of binary  $\text{RbLn}(\text{MoO}_4)_2$  systems. Figure 1; references 8: 7 Russian, 1 Western.  
[242-12172]

UDC 546.26-162

#### SYNTHESIS OF POLYMERIC GRAPHITE FLUORIDES

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 3, Mar 85  
(manuscript received 14 Dec 83) pp 817-819

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[Abstract] Low-temperature (200-220°C) synthesis of graphite fluoride polymers was obtained by the reaction of  $\text{HSO}_3\text{F}$  with  $\text{F}_2$  at 200-220°C, yielding a mixture of  $\text{HSO}_3\text{F}$ ,  $\text{HF}$ ,  $\text{SO}_2\text{F}_2$  and  $\text{S}_2\text{O}_6\text{F}_2$ . Reaction of  $\text{S}_2\text{O}_6\text{F}_2$  with graphite resulted in the formation of graphite oxyfluorides. Reaction of the latter with  $\text{F}_2$  resulted in the replacement of oxygen atoms by F, yielding polymeric graphite fluorides. Figures 2; references 7: 3 Russian, 4 Western.  
[242-12172]



EFFECT OF ION EXCHANGE ON CLINOPTILOLITE AND ITS MODIFICATIONS ON INTERNAL TENSION IN FILLED POLYORGANOSILOXANE

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 85  
(manuscript received 18 Aug 84) pp 25-27

KRUGLITSKAYA, V. Ya., PASHCHENKO, A. A., KRUGLITSKIY, N. N., LOMTADZE, O. G. and ROMANOVA, L. G., Institute of Colloid Chemistry and Water Chemistry, UkSSR Academy of Sciences; Kiev Polytechnic Institute

[Abstract] Numerous fillers are used to regulate formation of various compositional materials based on organic silicones. Ion exchange and chemical processes are used to alter surfaces as required, but changes in heat resistance often result as well as desired results. The present article reports on study of a widely-used polymethylphenylsiloxane lacquer, which was filled with clinoptilolite, a zeolite with the formula  $(Na_2K_2Ca)O \cdot Al_2O_3 \cdot 10SiO_2 \cdot 8H_2O$ . Various elements served as ionic cations. Modification was achieved by a mechanical chemisorption procedure. Internal tension was measured by the deviation from the original position of the free end of a flexible, cantilevered metallic disc relative to a stratum formed during evaporation of the solvent. Polymerization and polysaturation processes were also assessed. Results indicated that with 40% filler, all coatings had a low level of internal tension related to increasing homogeneity and ordering of the border layer. At 60%, internal tensions increased markedly in the coatings as interaction with the polymer declined, while at 80% it dropped again as polymer layers between mineral particles became smaller. Optimum balance of lyophilic and lyophobic zones on the surface were obtained with 0.05 and 0.7% octadecylamine, respectively. Figures 2; references 12 (Russian).  
[231-12131]

STUDY OF KINETICS OF FORMATION AND CONSUMPTION OF  $\text{NH}_2$  RADICALS IN PULSE LASER  
PHOTOLYSIS OF  $\text{NH}_3/\text{O}_3$  MIXTURE BY FLUORESCENT METHOD INDUCED BY LASER  
IRRADIATION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 23 Dec 83) pp 372-376

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[Abstract] The fluorescence method induced by laser irradiation has received wide application for studying gaseous phase chemical processes, partly due to its high sensitivity. The present article reports on an experimental device that combines this method with pulse laser photolysis; the device was used to study the kinetics of accumulation and expiration of  $\text{NH}_2$  radicals in an  $\text{NH}_3/\text{O}_3$  mixture. In particular, the kinetics of  $\text{NH}_2 + \text{O}_3 \rightarrow \text{NH}_2\text{O} + \text{O}_2$  were studied. The experimental device is diagrammed and discussed; one key difficulty was in eliminating a ghost image. Results indicated that there were considerable difficulties in explaining the concentration of  $\text{NH}_2$  that appeared in the experiment without a calculated adjustment in final values. The destruction or consumption of  $\text{NH}_2$  radicals was found to be in linear dependency on ozone pressure; the retardation of the reaction that resulted from the return of  $\text{NH}_2$  radicals to the original system was disregarded in the study, which may have a bearing on the results. Figures 3; references 13: 4 Russian, 9 Western. [234-12131]

SALTS OF 1-PHENYLVINYLPHOSPHONIC ACID

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 85  
(manuscript received 26 Mar 84) pp 55-56

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the Friendship of Peoples Polytechnic Institute imeni Abu Raykhan Beruni

[Abstract] Previous research has discussed only the monosodium salt of 1-phenylvinylphosphonic acid (1-PVPA). The authors report on synthesis of the compound with aliphatic, heterocyclic and aromatic amines. The structures of the resulting compounds were confirmed by infrared and NMR spectra. The amines were found to react with 1-PVPA to form monoamine derivatives similar to those of salts formed with alkaline metals. The limitation to monoaminic salts is attributed to spatial factors related to two voluminous substituents in 1-PVPA. This was confirmed by constructing spatial models in the manner of Stewart-Brigleb and Dreiding. Chemical procedures used in producing the monopotassium salt and the methylamine salt of 1-PVPA are summarized. Reference 1 (Russian).  
[233-12131]

UDC 519.2

STATISTICAL TREATMENT OF INDUSTRIAL DATA ON DEHYDROGENATION OF BUTYLENES INTO BUTADIENES

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 20-23

ALIYEV, A. M., KASHKAY, Zh. I., ISMAYLOV, O. A., GUSEYNOVA, A. M.,  
TALYSHINSKAYA, M. L. and SHAKHTAKHTINSKAIY, T. N., Institute of  
Theoretical Problems of Chemical Technology, Azerbaijan SSR Academy of  
Sciences

[Abstract] A statistical analysis was conducted on industrial-scale dehydrogenation of butylenes into butadienes using DM-2204 catalyst. Evaluation of the data for an 8000 h run led to a regression equation relating the yield of butadiene and selectivity to a number of parameters (temperature, flow rate, contact time, etc.). Tabular data are provided for the yields of divinyl in relation to industrial process conditions, showing that the kinetic model fits the process with a mean error of less than 5.7%. Figure 1; references 3 (Russian).

[235-12172]

UDC 622.276.1/4(479.24)

LARGE-SCALE HETEROGENEITY IN CROSS-SECTIONS OF PRODUCTIVE SEAMS IN APSHERON OIL AND GAS FIELDS

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 2, Feb 85  
pp 11-16

BURYAKOVSKIY, L. A. and LANTSBERG, Zh. S., IPGNGM [expansion unknown],  
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[Abstract] Geologic heterogeneity of seams in the Apsheron oil and gas fields was analyzed in statistical terms, making use of standard criteria. Thus, for a given parameter of interest,  $x$ , determinations were made of the dispersion,  $\sigma_x^2$ , mean square deviation,  $\sigma_x$ , and of the coefficient of variation,  $v_x$ . Analysis of the deposits in different areas of the

Apsheron peninsula in relation to sandiness, showed that in Western Apsheron hydrocarbon accumulation was favored by more favorable conditions than in Eastern Apsheron. In the latter area the seams with less than 30% sand content are hydrocarbon poor. However, in the Eastern Apsheron the seams are much larger than in Western Apsheron. Finally, the relationship between sandiness and potential productivity of the fields in Apsheron is less pronounced than in other regions with similar deposits. Figures 4; references 4 (Russian).  
[238-12172]

UDC 553.981.8(262.81)

#### CAUSES OF WATER AND GAS DISCHARGE IN DRILLING IN UPPER STRATUM OF BAKHAR FIELDS

Baku AZERBAIDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 2, Feb 85  
pp 16-19

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[expansion unknown]

[Abstract] An analysis was conducted on the petrographic and stratigraphic factors leading to water and gas discharge from drilling sites in the upper strata of the Bakhar fields. Basically, the Bakhar field consists of traps formed in Brachiaanticlinal formations with submeridional direction of strata. The roof of the formation extends for some 15 km, while its width is about 6 km. Drilling operations are frequently complicated by explosive gas and water discharges due to the fact that pressures in the strata exceed hydrostatic pressure two-fold, as a result of tectonic, hydrogeologic and lithologic combinations of factors. In combination with natural migration of water and gases in the various formations which lead to supernormal pressures at certain sites, poor drilling techniques or inadequate analysis of geological data leading to drilling explosions. One means of preventing such unwelcome developments lies in a more careful analysis and utilization of seismic, geochemical, and geophysical data. Figure 1; references 4 (Russian).  
[238-12172]

## CARBON ISOTOPE ABUNDANCE IN AZERBAIJAN OIL AND GAS

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 2, Feb 85  
pp 19-24

AZIZOV, T. S., MIRZOYEVA, F. I., GULIYEV\*, I. S. and DADASHEV\*, A. A.,  
Azerbaijan State University imeni S. M. Kirov; \*Institute of Geology,  
Azerbaijan SSR Academy of Sciences

[Abstract] Oil and gas samples obtained in Azerbaijan from depths approaching 5000 m were analyzed for carbon isotope abundance as an indication of a factor contributing to the formation of petroleum deposits. Analysis of oil samples demonstrated that  $\delta^{13}\text{C}$  ranged from 23.8 to 33.35‰, with the increase in the abundance of the light isotope showing a direct correlation with depth. Analysis of methane samples showed the inverse isotope abundance-depth relationship, with  $\delta^{13}\text{C}$  ranging from 34.8 to 55.0‰. These differences in the isotope abundance of oil and gas were interpreted to indicate that in the case of oil isotope abundance was predicated on thermocatalytic changes in hydrocarbon composition, while in the case of methane, thermodynamic conditions at the zone of generation determined the abundance ratios. Figures 2; references 4 (Russian).  
[238-12172]

UDC 622.276.752

## EFFECTS OF OIL CONTENT IN MICROEMULSIONS ON VISCOSITY AT VARIOUS TEMPERATURES

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 2, Feb 85  
pp 25-26, 35

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[Abstract] Viscosimetric studies were conducted on microemulsions in relation to temperature and oil content, using emulsions with an external aqueous phase. An inverse relationship prevailed between temperature (0-100°C) and viscosity. Analysis of the effects of hydrocarbon concentration on viscosity showed that viscosity vs. concentration plots went through maxima. In the case of 35% hydrocarbon concentration maximum viscosity was measured at 50°C, while an emulsion with 55% hydrocarbon concentration yielded a maximum value at 25°C. This phenomenon was ascribed to phase inversion, i.e., from an oil-in-water to a water-in-oil emulsion. Prior to the inversion point--in regions with an oil content of less than 20% or greater than 60%--the viscosity increased in direct proportion to the increase in oil content at low (25-30°C) temperatures. At higher temperatures (40-50°C) the viscosity remained unaffected. Figures 4; references 4 (Russian).  
[238-12172]

STRAIN-HARDENING IN THIXOTROPIC LIQUIDS

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 2, Feb 85  
pp 27-29

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[Abstract] Thixotropic coefficients were determined for 10, 15 and 20% aqueous bentonite solutions, yielding respective values of 0.17, 0.11 and 0.07. An increase in the concentration evidently accelerates hardening at rest and, when used as a model for drilling liquids, indicates that their thixotropic coefficients can vary widely (approximately from 0.05 to 0.5). The thixotropic coefficient can, therefore, be used as an indicator of strain-hardening with time. Figure 1; references 4 (Russian). [238-12172]

UDC 547.913.001.2

ESSENTIAL OILS OF FERULA ILIENSIS KRASN. ROOTS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 2, Mar-Apr 85 (manuscript received 21 Dec 82) pp 63-70

DEMBITSKIY, A. D., KROTOVA, G. I., SINITSIN, G. S. and SUYUNSHALIEVA, U. Kh.,  
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Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] Studies on the chemistry of *Ferula iliensis* Krasn. were expanded to an analysis of the essential oils of roots of plants grown in Kazakhstan. In general, the essential root oils of this species was determined to be quite similar to that of *F. assa foetida*. Using a combination of chromatographic and spectrometric methods led to the identification of 60 components in the essential oil fraction, prominent among which are alpha-pinene, camphene, beta-pinene, beta-myrcene, cis-beta-ocymene, trans-beta-ocymene, 2,3,4-trimethylthiophene, coapene, alpha-bisabolene, curcumin, and several butyl disulfidederivatives. Figures 6; references 12: 8 Russian, 4 Western.

[261-12172]



UDC 677.21.541.6

SYNTHESIS OF GRAFTED COPOLYMERS OF HYDRATE CELLULOSE WITH POLYVINYL FLUORIDE

Tashkent UZBEKSKIY KHMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 85  
(manuscript received 16 Jan 84) pp 26-28

USMANOV, S. N., VALIYEV, A. and ASAMOV, M. K., Tashkent Order of Labor's Red Banner State University imeni V. I. Lenin

[Abstract] One method for modifying properties of hydrate cellulose (HC) is the synthesis of grafted copolymers based on it thus producing modified materials with new properties, but also resulting in homopolymers. The present article reports on the synthesis of grafted copolymers of HC with vinylfluoride (VF) in the presence of cerium ammonium nitrate (CAN) in an aqueous solution of acetone with the hope of giving hydrophobic and grease-repellent properties to the HC. The initiator was  $\text{CAN-Ce}(\text{NH}_4)_2(\text{NO}_3)_6$ , and the solvent a pure acetone. Various other solvents and water as a swelling agent were tested. Results showed that chemical grafting polymerization of VF to HC depended on the concentration of the initiator and of nitric acid, and on the temperature of the reaction. The grafting resulted in the desired hydrophobic property and resistance to oils. Quadrivalent cerium was a key factor in successful grafting. Figures 2; references 7 (Russian).  
[233-12131]

UDC 541.15:66+678:744

POLYMERIZATION OF N,N-DIMETHYLAMINOETHYLMETHACRYLATE IN REACTION WITH PARATOLUENE-SULFONIC ACID

Tashkent UZBEKSKIY KHMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 85  
(manuscript received 3 Jul 84) pp 56-58

KHMELENKO, V. N. and RUZIYEV, R., Tashkent Order of the Friendship of Peoples Polytechnic Institute imeni Abu Raykhan Beruni

[Abstract] The possibility of broad use of ammonium polymers in such functions as polyelectrolytes and corrosion inhibitors, along with their

simplicity and technical economic considerations, make extensive study of such compounds very important. The present article reports on study of kinetic features of the polymerization of N,N-dimethylaminoethylmethacrylate (DMAEMA) in reaction with paratoluene-sulfonic acid (PTSA). Kinetic patterns were determined by a dilatometric approach. Reactions were conducted in solvents of water or ethanol, or mixtures of the two. Elemental analysis and NMR spectra indicated that, in spontaneous polymerization, a polymer formed with the structure of a protonized salt in a toluene-sulfonic form; the speed of reaction decreased as solvents were varied from ethanol to water. In aqueous solutions the resulting salt had polyelectrolytic properties. Figures 3; references 3 (Russian). [233-12131]

UDC 679.648.22.425

#### CROSS-LINKED POLYVINYL CHLORIDE COMPOSITES

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 67-71

MAMEDOVA, Z. A., AYUBOV, G. M., GUSEYNOVA, D. D. and BAYRAMOV, E. M.,  
Azerbaijan State University imeni S. M. Kirov; GNIPI [State Scientific  
Research and Planning Institute] "Gipromorneftgaz"

[Abstract] Studies were conducted on the chemical and physical characteristics of polyvinyl chlorides cross-linked by three different unsaturated sulfur-containing hydroxyethers. Cross-linking in the presence of ditertbutyl peroxide results in products with a gel fraction, the relative concentration of which is predicated on the cross-linking agents and ditertbutyl peroxide. Highest gel concentrations were obtained with polyvinyl chloride:cross-linking agent: ditertbutyl peroxide ratio of 90:9:1. Such cross-linked polymers were found to have superior thermal stability, impact strength, and tensile strength in comparison to the standard polymers. Figure 1; references 7 (Russian). [235-12172]

## ELECTRICAL STABILITY OF STRUCTURAL POLYMERS

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 6, Nov-Dec 84  
pp 72-77

ALIGULIYEV, R. M., AKHUNDOVA, F. A., NOVIKOV, Yu. V., DEL'TUVA, L. A.,  
KHITEYEVA, D. M. and ZELENEN, K. V., Azerbaijan State Medical Institute  
imeni N. Narimanov

[Abstract] Polyethylenes, polyvinyl chlorides and epoxide compounds were studied for their electrical stability on exposure to AC and DC currents. Analysis of data in the literature and experimental data on breakdown of dielectric properties of the materials in question led to the derivation of equations for critical voltages for both the AC and DC currents. On the basis of changes in the mechanical properties of materials exposed to test voltages, predictions can be formulated as to actual behavior of such materials when used as structural details. Figures 2; references 4 (Russian). [235-12172]

UDC 539.264.677.21

## INVESTIGATION OF LIQUID AMMONIA ACTIVATION OF COTTON MATERIAL DURING TRANSITION FROM CELLULOSE I TO CELLULOSE III

Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 28, No 3, Mar 85  
(manuscript received 7 Jul 83) pp 86-89

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[Abstract] In an attempt to explain the reason for additional activation of fibers, structural changes in the polymer were studied during formation of polymorphic modification of cellulose III with the ensuring effect of water on the textile material. Using the x-ray structural analysis method, the existence of pre-crystalline areas in the polymer were shown forming during the transition of cellulose I to cellulose III. These precrystalline areas had no highly ordered molecular chain distribution in the plane perpendicular to the axis of the fiber. The reason for the formation of these areas were explained. Structural changes of the cellulose resulting from the activation of water on the fiber treated with liquid ammonia indicate a stabilizing effect of humidity on the polymer, intensifying its inter-molecular interactions. It was shown that precrystalline areas of cellulose represent additional factors assuring activation of textiles. They appear to be in a metastable state. These structural changes of cotton fibers treated with liquid ammonia appear to be quite stable. Figures 2; references 4: 2 Russian, 2 Western. [244-7813]

## INHIBITION OF PHOTOOXIDATIVE BREAKDOWN OF CELLULOSE TRIACETATE WITH GRISZEOFULVIN

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHNOLOGIYA in Russian Vol 28, No 3, Mar 85 (manuscript received 18 Jul 83) pp 94-97

POLISHCHUK, B. O., POLISHCHUK, L. B., VOL'F, L. A. and MIRONOV, D. P.,  
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imeni Lenin's Komsomol; Tyumen State Medical Institute; Leningrad  
Institute of Textile and Light Industry imeni S. M. Kirov

[Abstract] Experimental results were reported of the investigation of photooxidative stability of triacetate cellulose (TAC) fibers after irradiation with full spectrum of mercury-quartz lamp PRK-2. The extent of photooxidative destruction was evaluated by the changes in characteristic viscosity and deformation-strength properties pre- and post-irradiation. In effect, the stabilizing activity of griseofulvin was evaluated. It was shown that the high effectiveness of griseofulvin as a photostabilizer of TAC fibers was achieved by concurrent action of at least two mechanisms: a light filtering and an inhibiting one. Figures 3; references 6: 5 Russian, 1 Western (by Russian authors).  
[244-7813]

## INVESTIGATION OF VULCANIZATION PROCESSES AND PROPERTIES OF BUTADIENENITRILE COMPOSITIONS USING METAL DITHIOPHOSPHATES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHNOLOGIYA in Russian Vol 28, No 3, Mar 85  
(manuscript received 13 Jul 83) pp 98-101

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[Abstract] Literature data are inadequate for the evaluation of metal ions' influence on the effectiveness of dithiophosphates used in the compositions of elastomers. The relationship between the effectiveness of diisobutyldithiophosphoric acid salts (I) and metal ions was investigated. It was shown that the nature of metal ions of I had a definite effect on technological and physical-chemical properties of elastomers. Based on SKN, organophosphoric accelerators coupled with complex forming metal ions exhibited positive effect on the process of heat aging demonstrating long inductive period and highly effective cross-linking. Thus, metal complexing salts of dithiophosphoric acid are recommended as accelerators of

polyfunctional sulfur vulcanization agents for elastomers from SKN.  
Figures 3; references 16: 14 Russian, 2 Western.  
[244-7813]

UDC 541.64:539.2

#### NEW TYPE OF METAL POLYMERS -- METALLIC CLUSTERS IN POLYMER MATRICES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 10 Jun 83) pp 689-695

KOSOBUDSKIY, I. D., KASHKINA, L. V., GUBIN, S. P., PETRAKOVSKIY, G. A.,  
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Institute of Physics imeni L. V. Kirenskiy, Siberian Department, USSR  
Academy of Sciences

[Abstract] Polymer compositions containing metallic clusters (subatomic metal particles) represent considerable technological interest. In the present paper formation of highly-dispersed metal particles in polymer is described based on monomolecular thermal breakdown of organometallic compounds of transition metals. To the polymer material heated in boiling oil under an atmosphere of argon, solutions of  $\text{Fe}(\text{CO})_5$ ,  $\text{Cr}(\text{CO})_6$  or  $\text{Ni}(\text{HCOO})_2$  were added; the final product was separated from oil by repeated washing with solvent. The mechanism of this process was studied with  $^1\text{H}$  and  $^{19}\text{F}$  NMR. By decreasing the motility of molecular chains, these metal clusters increased the thermal stability, density and magnetic properties of polymer compositions. The dimensions of these clusters varies, the larger ones concentrated in amorphous areas of the plastic, the smaller ones -- in crystalline areas. The compositions obtained are powders easily processed into various end products with retention of their properties. Figures 7; references 6: 4 Russian, 2 Western.  
[252-7813]

# POROUS STRUCTURE OF INTERPENETRATING POLYMER NETWORKS OBTAINED FROM OLIGOESTERACRYLATE BY AN ANIONIC MECHANISM

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 29 Jun 83) pp 696-701

LIPATOVA, T. Z., SHEVCHUK, Ye. S. and KUZ'MENKO, L. S., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] The relationship between the porous structure of an interpenetrating polymer network (IPN) and the synthetic method used was investigated along with the treatment of the oligoesteracrylate matrix and the conditions prevalent during the introduction of a penetrating network. The total volume of the pores thus obtained and their specific internal surface were determined. Networks obtained from  $\alpha,\omega$ -dimethacryl-bis-(diethyleneglycol)-phthalate, styrene copolymers with divinyl benzene and IPN synthesized from two of the above networks were used. Porosity of these networks was studied by absorption of n-hexane. The porosity of final products depended on the preparation and treatment of the matrix network as well as on the formation conditions of the penetrating lattice. Coulomb's interactions of charged fragments of both networks played an important role in forming porous IPN. Anionic IPN with well developed porosity could be obtained by synthesizing the matrix lattice in presence of a large quantity of monomers from which the penetrating network could be formed or by carrying out the synthesis in dilute solutions facilitating formation of microporous matrix networks. Figures 2; references 14: 10 Russian, 4 Western (2 by Russian authors). [252-7813]

UDC 541(49 + 64 + 183.12)

# EFFECT OF ACIDITY OF NETWORK POLYELECTROLYTE IONOGENIC GROUPS ON STRENGTH OF PROTEIN-POLYMER COMPLEX

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 29 Jun 83) pp 702-706

SHATAYEVA, L. K., RADZYAVICHYUS, K. I. and SAMSONOV, G. V., Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Reaction of protein macromolecules with network polyelectrolytes containing various acid functional groups was studied. Standard porous cationites containing sulfo-, phosphonic and carboxyl groups were used with crystalline pepsin and  $\alpha$ -chymotrypsinogen A. It was shown that the conditions for protein binding to network polyelectrolyte depended on the isoelectric point of proteins and the acidity of polyelectrolyte functional groups. Thus, knowing the charge of protein macromolecule, the pH range of the stability of protein--polymer complex could be varied by varying the acidity of polyelectrolyte ionogenic groups. The use of carboxyl cationites results in weakest intermolecular interactions with protein macromolecules. Figures 3; references 16: 12 Russian, 4 Western. [252-7813]

## HETEROPHASIC POLYMERIZATION OF ACETYLENIC MONOMERS IN PRESENCE OF IMMOBILIZED MOLYBDENUM COMPLEXES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 9 Jul 83) pp 707-714

POMOGAYLO, A. D., KIIYASHKINA, Zh. S., KUZAYEV, A. I., YECHMAYEV, S. B.,  
IVLEVA, I. N. and D'YACHKOVSKIY, F. S., Division of the Institute of  
Chemical Physics, USSR Academy of Sciences

[Abstract] Heterophasic polymerization of phenylacetylene and other acetylenic monomers catalyzed by molybdenum complexes was studied.  $\text{MoCl}_5$  was fixed on the surface of high density PE modified by grafted acrylonitrile, 4-vinylpyridine, allyl and propargyl alcohol and acrylic acid. In addition, the valence state of Mo at the active centers was determined showing that these centers form as the result of rapid interaction of monomer with fixed Mo(V) or Mo(IV), representing diamagnetic ions Mo(IV). Immobilization of molybdenum halides affects all stages of the polymerization process but primarily it affects the coordination mechanism increasing the yield and molecular weight of polyphenylacetylene. The content of molybdenum on the carrier during the polymerization does not decrease, showing that the reduction occurs without affecting the molybdenum bonds to the carrier. This permits regeneration of the catalyst by chlorinating reduced Mo fixed on the carrier. Figures 7; references 14: 11 Russian, 3 Western (1 by Russian authors Kryashkina).  
[252-7813]

## THERMOPHYSICAL CHARACTERISTICS OF IRRADIATED POLYSTYRENE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4,  
Apr 85 (manuscript received 19 Jul 83) pp 715-720

BRISKMAN, B. A. and ROZMAN, S. I., Scientific Research Physical-Chemical  
Institute imeni L. Ya. Karpov

[Abstract] Systematic study of the effect of irradiation by electrons and mixed gamma-neutrons on thermal conductivity, density and coefficient of thermal expansion of atactic polystyrene (PS) was undertaken in a wide range of temperatures and adsorption dosages. The coefficient of thermal expansion at low temperatures drops with increased adsorption dose (to 5-10 MHz) and then begins to rise gradually. At higher temperatures the changes are less pronounced and disappear completely at about 40°C. A model for radiation changes of  $\lambda$  in PS was proposed which considered the contributions from intermolecular interactions; the model was based on a lattice mechanism of thermal conductivity. Inconsistencies in present and

literature data were discussed on the basis of this model. Figures 3; references 10: 9 Russian (1 by Western author), 1 Western. [252-7813]

UDC 541.64:547.1'128

#### SYNTHESIS OF GRAFTED COPOLYMERS IN POLYSTYRENE--POLYSILOXANE SERIES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 11 Aug 83) pp 749-755

ZHDANOV, A. A., ZAVIN, E. G. and BLOKHINA, O. G., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences

[Abstract] The goal of the present work was to study ionic graft copolymerization of oligostyrenecarbocyclosiloxanes (OSCS) with oxamethylcyclotetrasiloxane (OMCS). A calculated quantity of the initiator was added to a solution of OSCS in toluene and the mixture was stirred for 0.5 hr at 110-112°C. Then OMCS was added and the polymerization was continued. The composition of these copolymers was analyzed by IR and NMR spectroscopy indicating increased content of siloxane segments with increased conversion of OMCS. Grafted copolymers of the PS-polysiloxane series appeared to be soluble rubber-like products differing from the starting OSCS and PS as well as from the polydimethylsiloxane. Kinetic function of the yield and viscosity of the system have an S-like shape. The thermomechanical curves obtained for these copolymers indicated presence of temperature transition analogous to glass transition temperatures of both the polydimethylsiloxane and PS-blocks in the macromolecules of grafted copolymers. Figures 5; references 13: 6 Russian (1 by Western authors), 7 Western. [252-7813]

UDC 541 (64 + 127): 542.943

#### CORRELATION OF KINETIC PARAMETERS OF CONTACT THERMOOXIDATION AND CHANGES OF COHESION PROPERTIES OF INTERFACE OF POLYMER DURING THERMAL ADHESIONAL INTERACTION OF POLYETHYLENE WITH STEEL

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 18 Aug 83) pp 793-799

KALNIN', M. M. and MALERS, Yu. Ya., Riga Polytechnic Institute  
imeni A. Ya. Pel'she

[Abstract] The goal of this study was to explain the regulatory pathways for the process of contact thermooxidation; in the present paper regulations were established connecting kinetic parameters of oxidation and changes of the adhesive strength of various compounds. Specifically, contact oxidation of PE on the surface of steel was studied along with the changes in the



resistance to layer separation, A, of the PE adhesional compounds forming during thermal contact with free access of oxygen through the polymer layer. It was shown that the quantity of absorbed oxygen and the amount of evolving CO<sub>2</sub> were related to changes in the value of A as were the content of CO groups, of the Fe being transported into the polymer phase and the change of the mass of the oxidized layer. Figures 6; references 15: 13 Russian, 2 Western.

[252-7813]

UDC 541(64 + 127)

FORMAL KINETIC DESCRIPTION OF PLY-SEPARATION RESISTANCE OF ADHESIONAL  
POLYETHYLENE-STEEL COMPOUNDS AS A FUNCTION OF CONTACT DURATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 18 Aug 83) pp 800-805

KALNIN', M. M. and MALERS, Yu. Ya., Riga Polytechnic Institute  
imeni A. Ya. Pel'she

[Abstract] The goal of the present study was to describe extremal functions of the resistance of ply-separation A(t) directly from the position of formal kinetics without an attempt to connect them quantitatively with their respective kinetic functions of polymer-analogous and macromolecular conversions. Experimental observations of the separation of adhesive compounds from steel expressed as a function of time of contact could be described by a simple expression based on a concept of two processes occurring in opposite directions. The same law described the effective rate constants of these processes and kinetic parameters of thermal oxidation expressed as functions of the layer thickness and of the temperature. Figures 5; references 7 (Russian).

[252-7813]

UDC 541.64:539.3

DIRECT SYNTHESIS OF AROMATIC POLYAMIDOACIDS UNDER INFLUENCE OF CATALYTIC  
COMPOSITIONS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 18 Aug 83) pp 812-817

NOSOVA, G. I., KOTON, M. M., LAYUS, L. A., SAZANOV, Yu. N., DENISOV, V. M.,  
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Compounds, USSR Academy of Sciences

[Abstract] In recent years several methods were proposed for synthesis of aromatic polyamides by direct polycondensation of dicarboxylic acids and

aromatic diamines under the influence of various catalytic systems. In the present paper, synthesis of high molecular weight polyamidoacids was reported based on direct polycondensation of aromatic tetracarboxylic acids with aromatic amines in presence of triphenylphosphite or diphenylsulfite and tertiary amine. These polyamidoacids were quite stable on storage for up to 1-3 weeks. Effects of various reaction conditions on the final products were studied. Figures 3; references 5: 2 Russian, 3 Western.  
[252-7813]

UDC 541.64:532.71

#### GAS PERMEABILITY OF COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 18 Aug 83) pp 818-824

TEPLYAKOV, V. V., IYEVLEV, A. L. and DURGAR'YAN, S. G., Institute of Petrochemical Synthesis imeni A. V. Topchiyev, USSR Academy of Sciences

[Abstract] Possibility of applying correlational regularities combining gas properties of the gas-polymer system with the transport parameters of characteristic homopolymers to complex polymer systems based on statistical and block polymers such as polydienes, polydimethyl siloxane, polyvinyl-trimethylsiloxane and polyolefines was investigated. In spite of complex composition of some copolymers, effective diffusion coefficients of inert and some polyatomic gasses decreased with increasing diameter  $d_{ef}^2$  in the order:  $D_{He} > D_{H_2} > D_{Ne} > D_{O_2} > D_{Ar} > D_{CO_2} > D_{N_2} > D_{CO} > D_{C_2H_4} > D_{Kr} > D_{Xe}$  characteristic of copolymer

action. It was shown that correlational equations developed for homopolymers could be applied with success in analysis of gas permeability parameters of copolymers as well. Figures 2; references 14: 7 Russian, 7 Western.  
[252-7813]

## MECHANISM OF BUTYLMETHACRYLATE POLYMERIZATION INITIATION WITH SILICON MONOPEROXIDE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 20 Aug 83) pp 825-830

NISTRATOVA, L. N., KOPYLOVA, N. A., SEMCHIKOV, Yu. D., YABLOKOVA, N. V.,  
KABANOVA, Ye. G., KURSKIY, Yu. A. and ALEKSANDROV, Yu. A., Scientific  
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imeni N. I. Lobachevskiy

[Abstract] Polymerization of butylmethacrylate initiated by  $\text{Me}_3\text{SiOOCMe}_3$  (SiM) was studied using the example of silicon monoperoxide quantitative characteristics and mechanism of the initiation of the breakdown of -Si-O-O-C- fragment was described. To activate this breakdown, Lewis acids were used which could be ordered in the following descending series by their effect on the polymerization rate:  $\text{SnCl}_4 > \text{ZnCl}_2 > \text{R}_2\text{SnCl}_2 > n\text{-Bu}_3\text{SiCl}$ . Increased polymerization rate initiated by SiM was counterbalanced by decreased activation energy and MW of the polymer. The polymerization rate appeared to decrease with excess levels of Lewis acids as compared to the peroxide. It was shown that the formation of a complex between components of the initiating system was responsible for the increased rate of the initiation of polymerization. Figures 2; references 8: 3 Russian, 5 Western (1 by Russian authors).  
[252-7813]

UDC 541.64:539.3

## MECHANICAL PROPERTIES OF POLYMER COMPOSITIONS BASED ON POLYETHYLENE OBTAINED BY IN SITU POLYMERIZATION METHOD

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 21 Aug 83) pp 831-837

VOLYNSKIY, A. L., SHTANCHAYEV, A. Sh., ZANEGIN, V. D., GERASIMOV, V. I.  
and BAKYEV, N. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Industrial films from high density polyethylene were studied by stretching them in liquid monomers containing initiators and cross-linking agents. Then these samples were polymerized for 8 hrs and heated to 100°C for 1 hr. Mechanical properties of these compositions were evaluated showing that they possessed elevated strength and plasticity in those cases where the introduced polymer component was in glass-like state, so that increased plasticity of such materials was shown to be related to altered mechanism of material deformation. In such cases material elongation was achieved because of some change in the forms of highly dispersed skeleton structure of the composite. Figures 4; references 7: 4 Russian, 3 Western.  
[252-7813]

# THERMAL STABILITY OF CHLORINE CONTAINING POLYMERS AND ITS EFFECT ON THEIR COMPATIBILITY WITH POLYMETHYLMETHACRYLATE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 21 Aug 83) pp 838-843

CHALYKH, A. Ye. and SAPOZHNIKOVA, I. N., Institute of Physical Chemistry, USSR Academy of Sciences

[Abstract] Effect of thermal stability of the components of polymer mixtures on their phase equilibrium was studied on PVC-PMMA and on chlorinated PE-PMMA systems using microanalytical electron-probe method. The kinetics of dehydrochlorination was studied under isobaric-isothermal conditions showing that polymer solubility is related to the degree of dehydrochlorination. Preparation conditions of the mixtures appeared to affect compatibility of the components and their changes during annealing. The duration of thermal annealing was limited by induction period of the initiation of thermal breakdown of the polymer and by the period of the formation of cross-linkages. Figures 7; references 23: 14 Russian (3 by Western authors), 9 Western.  
[252-7813]

# MECHANICAL AND DIELECTRIC PROPERTIES OF SOLIDIFIED EPOXYDIANE PHENOLFORMALDEHYDE OLIGOMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 4, Apr 85  
(manuscript received 24 Aug 83) pp 849-856

MARKEVICH, M. A., PRUT, E. V., POTAPOV, V. V., SHEVCHENKO, V. G. and PONOMARENKO, A. T., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Three dimensional polymers based on epoxydiane oligomers exhibit excellent mechanical and dielectric properties. Deformational and strength characteristics of such polymers with varying MW and resol phenolformaldehyde oligomers were investigated. It appeared that mechanical strength of such network polymers did not depend on historical data of thermal treatment nor on the thickness of the test specimens. The temperature of polymer vitrification was determined by differential scanning calorimetry and dielectric relaxation methods showing that  $T_g$  is a constant, independent of  $M_g$  at high values;  $T_g$  gradually increases with decreasing  $M_g$  values. Some anomalies of mechanical and thermophysical properties of network polymers may be related to structure differences of the starting oligomers (linear vs. branched components). Figures 4; references 20: 17 Russian, 3 Western.  
[252-7813]

## RADIATION-CHEMICAL PROCESSES IN POLYETHYLENE AT HIGH TEMPERATURES

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 24 Jan 84) pp 109-115

KIRYUKHIN, V. P., KLINSHPONT, E. R., and MILINCHUK, V. K., Scientific  
Research Physico-chemical Institute imeni L. Ya. Karpov

[Abstract] Low-density polyethylene was subjected to  $\gamma$ -irradiation from  $^{60}\text{Co}$  at doses of 5-7 billion disintegrations per second and pressures of 0.5-1.5 gigapascals. At such pressures, the formation of macroradicals, predominately allyl, is higher than at normal pressures. At 300° K, irradiation leads to cross-linking and gel formation, but at 0.5 gigapascals, the radiochemically induced cross-linking and bond cleavages are approximately 1.4 times and 2 times less than at normal pressure. At 450° K, gel formation takes place at about a tenth of the dose level required at normal temperature. Under these conditions, radiation cleaves vinylidene double bonds much more rapidly than under normal conditions. These double bonds are directly involved in the chain mechanism for cross-linking which increases 15-30 times at high pressures. By lowering the intermolecular distances, high pressures also lower the potential barrier and increase the speed of reaction of terminal alkyl radicals with macromolecules about 10 times. Figures 4; references 12: 6 Russian, 6 Western (1 by Soviet author Milanchuk).  
[251-12672]

UDC 541.64:537.311

## INFLUENCE OF DONOR-ACCEPTOR ADDITIVES ON RADIATION ELECTROCONDUCTIVITY OF POLYMERS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 28 May 84) pp 116-121

DUBENSKOV, P. I., TYUTNEV, A. P., SAYENKO, V. S. and VANNIKOV, A. V.,  
Institute of Electrochemistry imeni A. N. Frumkin, USSR Academy of Sciences;  
Moscow Institute of Electronic Machinebuilding

[Abstract] Films of poly-N-vinylcarbazole and poly-N-epoxypropylcarbazole were formed on aluminum substrates by evaporation of dichloroethane solutions; vacuum deposition of silver then provided a second electrode. Films of polystyrene were also prepared from polyethyleneterephthalate with two silver electrodes. Additives (rhodamine 6Zh, nitroxyl radicals, or tetracyanethylene) were also included at concentrations of 5-10 mol %. Electroconductivity was tested with discrete electron impulses of 300  $\mu\text{s}$  duration with an energy of 65 keV. Measurements were conducted at 300-420° K in a vacuum chamber and showed both a rapid and a delayed component of the

electroconductivity, which was very temperature-sensitive. While electron acceptors only weakly influenced the electroconductivity, acceptors of holes lowered it more than 20-fold, strongly indicating that charge conductivity is primarily by movement of holes rather than electrons, especially in the carbazole compounds. Figures 2; references 14: 4 Russian, 10 Western (2 by Russian authors).  
[251-12672]

UDC 541.15.648.742

# INTERMEDIATE STATES OF POLYETHYLENE RADIOLYSIS PRODUCTS CONTAINING DOUBLE BONDS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 21 Feb 84) pp 122-127

BORZOV, S. M., SUKHOV, F. F. and SLOVOKHOTOVA, N. A., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov

[Abstract] Samples of polyethylene, having crystallites with straightened chains, and of n-octane were subjected to fast electron irradiation at 20° K. Infrared spectroscopy indicates the initial formation in polyethylene of transvinyl bonds which complex with carbonium ions. As the samples are warmed to 80-100° K, these complexes break up and there is an increasing accumulation of free allyl radicals. Further heating to 130° K results in migration of radical centers to the ends of the polyethylene chains with the formation of terminal allyl radicals which apparently complex with migrating carbonium ions. Analysis of n-octane shows analagous formation of vinyl bonds, associated with alkenes formed by the irradiation, and carbonium ions complexing with them. Heating to 100° K apparently leads to the formation of microphases of propene. Further heating to 160° K brings an apparent increase in vinyl bonds as a consequence of such processes as intramolecular recombinations of free radicals. Overall, the complexing of carbonium ions with double bonds and allyl radicals in irradiated polyethylene and ocatane appears to be one of the conditions of stabilizing the positive charges formed during irradiation. Figures 3; references 11: 5 Russian, 6 Western.  
[251-12672]

## SURFACE MACRORELIEF OF FILM FORMED BY GAS-DISCHARGE POLYMERIZATION

Moscow KHIMIYA VYSOKIKH ENERGII in Russian Vol 19, No 2, Mar-Apr 85  
(manuscript received 30 Oct 83) pp 155-159

ZYN', V. I., POTAPOV, V. K., TUZOV, L. S. and SHTERENBERG, A. M.,  
Kuybyshev Polytechnical Institute imeni V. V. Kuybyshev

[Abstract] Polymer films were formed on vertical electrodes and aluminum substrates by glow discharge of 50 mm length in vapors of styrene, octamethyltrisiloxane, or hexamethyldisilazane at pressures of 20-100 Pa, current densities of 1-10 A/m<sup>2</sup> and frequencies of 1-40 kHz. Film thickness was measured by a microinterferometer and the surface structure examined with an electron microscope. Film thicknesses on vertical electrodes were clearly larger on the lower portions due to gravitational settling of polymeric globules formed in the gas phase. Similarly, there were noticeably more globules on the lower portions of substrates than on upper ones. Film thickness indicated several known mechanisms of polymerization and transport were taking place. These were assumed to operate independently so that the total distribution could be determined by summing the partial functions of the individual mechanisms, including electro-gas-dynamic factors and polymerization at active centers on the surface of the substrate. Nonsymmetrical distribution on the substrate was observed only when there was both a charge regime which allowed polymerization in the gas phase and a vertical substrate surface. Because of uncontrolled deposition of macroparticles from the gas phase, film thickness could vary by a factor of ten depending on placement of the substrate relative to the edge of the discharge. Figures 4; references 10: 8 Russian, 2 Western.  
[251-12672]

UDC (678.644'141)02:547.281.1

## IMPROVEMENT OF TRIOXANE SYNTHETIC PROCESS

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 4-5

PAKULIN, V. V., PAVLIKOV, R. Z., CHILIPENKO, N. G., YARKOV, P. I. and  
LEBEDEVA, N. N.

[Abstract] In an attempt to obtain trioxane using a gaseous method, its synthesis was performed as follows. Concentrated solution of formaldehyde and sulfuric acid was heated in the reactor to the boiling point. The vapors were condensed and collected. The liquid level in the reactor was maintained by adding gaseous formaldehyde. After a stable state was reached, reaction mixture and the distillate were sampled to analyze the composition by chemical and chromatographic methods. Using the gaseous method increased the yield of the trioxane and the degree of conversion of formaldehyde to

trioxane, while decreasing formation of formic acid. On the basis of laboratory tests, a pilot plant was constructed, reproducing the results obtained on the glass scale. This led to considerable technical improvement and economic savings of about 237,000 Rubles annually. References 4 (Russian). [250-7813]

UDC 678.5:66.062-278:539.3

#### ANION EXCHANGE MEMBRANES BASED ON AMINOALKYL ESTERS ON METHACRYLIC ACID

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 10-11

TEVLINA, A. S. and AKULOVA, T. P.

[Abstract] To obtain chemical grafting on hexafluoropropylene copolymer with vinylidene fluoride, benzene, toluene and heptane were used as solvents and a number of aminoalkyl esters of methacrylic acid as monomers to be grafted. The final products contained a tertiary amino group. Analysis of specific electric resistance ( $\rho_v$ ) of the membranes prepared from these grafted copolymers showed that  $\rho_v$  changes insignificantly in acid medium and drops sharply in neutral medium. Based on the data of energy of activation of membrane resistance which was found to be rather low, it was concluded that there is no specific interaction between anions and functional groups. Electroconductivity of these new membranes was higher than that of the standard ones. Their principal properties did not change even after prolonged storage in acid medium and the temperature ranging from 20 to 80°C. References 4 (Russian). [250-7813]

UDC 678.664(088.8)

#### SYNTHESIS AND PROPERTIES OF POLYESTERURETHANE OLIGOMERS WITH FURANE RINGS

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 13-15

NIKOLAYEV, V. N., LOGUNOV, G. I. and NIKOLAYEVA, L. I.

[Abstract] Polyester urethane oligomers containing terminal furane rings (PUOFC) were synthesized in two stages. In the first step polyester component was reacted with excess diazocyanate yielding liquid macrodiisocyanates. At the second stage these diisocyanates were modified with furyl alcohol. Physical, chemical and mechanical properties of these new products were reported. Epoxy-urethane polymers containing PUOFC exceeded the polymers with inactive plasticizers in many of their properties, including thermal stability. Thus it was shown that these new products could be effectively used in many applications including modifications of epoxyresins. Figures 2; references 6 (Russian). [250-7813]



## LONGEVITY OF FILM POLYMER ELECTRETES

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 15-16

BORISOVA, M. E., ZAKREVSKIY, V. A., KOYKOV, S. N., SANFIROVA, T. P. and  
TIKHOMIROV, A. F.

[Abstract] Studies of mechanical longevity of polymer electretes are of particular interest because electretic membranes are used as sensitive elements in many detectors and usually perform under stressed conditions so that the polymer film is subject to mechanical loads and to electric fields. Properties of a polytetrafluoroethylene film (F-4) were evaluated. When exposed to an external charge, two processes develop in charged polymers with different rates of the breakdown of a macromolecule at different intensities. Thus, it was shown that under the influence of electric field, the longevity of polymers is lowered due to accelerated processes of macromolecular breakdown. Figure 1; references 3 (Russian).  
[250-7813]

UDC 678.744.342:547-312

ANTIFUNGICIDAL PROPERTIES OF TIN-ORGANIC DERIVATIVES OF MALEIC ANHYDRIDE  
COPOLYMERS WITH METHACRYLATES

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 17-18

MISHCHENKO, V. F., ZUBOV, V. A., YEREMENKO, Yu. G. and SADOVSKAYA, I. A.

[Abstract] Tin organic compounds are used as protectors of various materials from biological attacks. The most effective are tin organic derivatives of maleic anhydride. A series of tin organic derivatives of maleic anhydride copolymers with metacrylate were synthesized showing that tin organic polymers are more effective as antifungal agents than compositions based on low molecular tin-organic compounds. The acrylate polymers showed especially high activity. Overall, it was shown that biostability of tin-organic polymers dropped with increased length of substituent molecules at copolymer linkages neighboring with tin-organic segments. Also, the activity dropped when these substituents exhibited nucleophilic properties causing additional binding of tin-organic biocides with polymer skeleton along the donor-acceptor type interaction. References 8: 7 Russian (3 by Western authors), 1 Western.  
[250-7813]

## EFFECT OF POLYMER MODIFIERS ON STABILITY OF IMPACT RESISTANT PVC TOWARDS THERMO-OXIDATIVE ACTION

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 24-25

BURLAKOVA, G. I., ZAVAROVA, T. B., LEBEDEV, V. P., SAVEL'YEV, A. P. and FEDOSEYEVA, G. T.

[Abstract] Polymer modifiers are introduced into polyvinyl chloride (PVC) in order to increase its impact resistance. Their effect on the impact resistant PVC exposed to thermal oxidation was studied. As a result of aging at similar thermostabilities, the lowest deformational ability was shown by a composition containing MBS type modifiers (Inkar-27 and BTA-3N). Evidently, chemical aging occurred due to thermooxidation of these modifiers. The stability of polymer modifiers towards thermooxidative action determines maximum utilization time of impact resistant PVC. This useful period may be extended by employment of oxidation resistant modifiers. Figure 1; references 4: 2 Russian (1 by Western author), 2 Western.

[250-7813]

## EFFECT OF SALT FORMATION IN RADIATION GRAFTED SYSTEMS PE + PAA ON PARAMETERS OF MASS TRANSFER

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 29-31

BABKIN, I. Yu., BURUKHIN, S. V. and KRASNOGOROV, A. I.

[Abstract] Diffusion permeability of polymers is one of their most important characteristics, especially during their utilization in chemically and physically active media. Changes in mass transfer parameters were studied resulting from polymer analogous conversions, using a grafted copolymer with reactive side groups as a model: a polyethylene (PE) system obtained by radiation grafting polymerization of polyacrylic acid (PAA). It was shown that grafting PAA resulted in lowered diffusion and permeability coefficients of heptane. Stabilization of the properties of grafted system was facilitated by conversion of the grafted acid form into a salt counterpart. Conversion of PAA into a salt form improved the barrier properties and increased the stability of the grafted system PE + PAA due to the formation of compounds with lower mobility of segments and bridges cross-stitching the grafted chains. Figure 1; references 3 (Russian).

[250-7813]

## COMBINED FILM MATERIALS WITH PHOTOCHEMICALLY SOLIDIFIED GLUE LAYER

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 37-39

MYSHKO, V. I. and KACHAN, A. A.

[Abstract] Experimental results are reported of the study of composition and preparation conditions as they affected the adhesive strength and water stability of combined film materials containing a photochemically solidified glue layer. Such materials were obtained by UV irradiation of two films connected with a glue layer. Non-filtered UV light was used in air without heating. Under the influence of UV, in presence of photosensitizers, free radicals were formed initiating polymerization of acrylic acid used as the photosensitizer and its grafting on the support material assuring high adhesive strength and water resistance of the glue. In practical tests adhesive strength of the glue depended on the amount of glue composition used per 1 m<sup>2</sup> of the material. It was shown that such combined materials made of polyethyleneterephthalate and high pressure polyethylene or metal plastic satisfied the requirements placed on packaging and anticorrosive materials. Figure 1; references 3 (Russian).

[250-7813]

UDC 678.05-19:537

## NEW ELECTROCONDUCTIVE COMPOSITION

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 p 61

SARKISYAN, E. S. and MIRZOYAN, M. A.

[Abstract] A two component electroconductive composition GIPK-153 was developed for shielding radioelectronic equipment. In contrast to other available covers, it showed high electroconductivity and dried quickly in air. This composition is a homogeneous black liquid requiring two application either by a sprayer or a brush. One application is not enough, more than two are not needed. This composition is used currently in color TV replacing shielding plates made of non-ferrous metal. References 2 (Western, US and Japanese patents).

[250-7813]

## UTILIZATION OF ANTISTATIC ADDITIVES

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 62-63

SHEVERDYAYEV, O. N., LAKHNO, A. V., AFANAS'YEV, S. R., PUDOV, V. S. and NIKOLAYEVA, T. G.

[Abstract] The effect of increased content of effective antistatic materials on specific surface electric resistance ( $\rho_s$ ) of PVC was investigated. It was shown that introduction of antistatic agents into the body of a polymer provides better and longer lasting antistatic properties than deposition of antistatic agents on the surface of various polymers. References 3 (Russian). [250-7813]

UDC 541.64:532.5:547.39

## SYNTHESIS AND HYDRODYNAMIC CHARACTERISTICS OF POLY(4-VINYLPYRIDINE) PARTIALLY ALKYLATED BY CHLOROACETIC ACID

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 2, Mar-Apr 85 (manuscript received 26 Aug 82) pp 33-38

DZHUMADILOV, T. K., BAKAUOVA, Z. Kh., ROGANOVA, Z. A., SMOLYANSKIY, A. L. and BEKTUROV, Ye. A., Order of the Red Banner of Labor Institute of Chemical Sciences, Kazakh SSR Academy of Sciences

[Abstract] Poly(4-vinylpyridine) (P4VP) was synthesized by radical polymerization in toluene with benzoyl peroxide with ca. 60% conversion, and subsequently isolated by fractional precipitation with ethyl acetate at 25°C. Alkylation of P4VP by chloroacetic acid in dimethylformamide at 50°C for 24 h yielded P4VP-betaine HCl (P4VPB). IR and UV spectroscopies of P4VPB yielded data characteristic of a polyelectrolyte. Determinations of intrinsic viscosity in 0.005 to 3.0 N KCl showed decrease in viscosity, beginning with 0.1 N KCl. This change was ascribed to a decrease in electrostatic interaction among the positively charged pyridine moieties and, consequently, diminution in their contribution to conformational stabilization. At [KCl]  $\mu$  = 0.5 N P4VPB generally becomes insoluble (depending on the MW) as a result of predominance of hydrophobic interactions over hydrophilic. Thus, conformational stability of P4VPB in aqueous salt solutions has been shown to depend largely on interaction between bipolar ions and repulsive forces among pyridine ions. In low ionic strength solutions P4VPB behaves as a polybase, while in higher strength solutions as a polyampholyte. Figures 3; references 7 (Russian). [261-12172]

VISCOSIMETRIC AND SPECTROSCOPIC STUDIES ON Cu(II) COMPLEX WITH WATER-SOLUBLE ACRYLIC ACID-METHYL METHACRYLATE COPOLYMER

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 2, Mar-Apr 85 (manuscript received 5 May 82) pp 86-89

FROLOVA, V. A., ZHAYMINA, G. M., KUDAYBERGENOV, S. Ye. and BEKTUROV, Ye. A.,  
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[Abstract] Viscosimetry and IR and UV spectroscopies were used to follow complex formation between Cu(II) and the water-soluble acrylic acid-methyl methacrylate (AMM) copolymer. The spectroscopic data indicated that, on the average, one copper ion is bound to three polymeric carboxyl groups. Viscosimetric studies showed that, on transition from water to methanol, the intrinsic viscosity of the complex decreases at ca. 20% methanol. A further increase in the methanol concentration leads to a sharp increase in the intrinsic viscosity with retention of the complex according to UV data. The increase in viscosity was apparently due to conformational restructuring, resulting from rupture of bridges between Cu(II) and distal carboxyl groups and formation of new coordination bonds with carboxyl groups in close proximity. This is accompanied by a transformation of the copolymer from a compact configuration in the aqueous environment into a more unfolded state in the organic environment. Figures 3; references 3 (Russian).  
[261-12172]

RELATIONSHIP OF AMORPHOUS AND CRYSTALLINE STRUCTURE OF POLYMERS TO OXIDATION OF GAMMA-RADIATION-INDUCED RADICALS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85  
(manuscript received 1 Mar 83) pp 464-468

MAKSIMOV, V. L., PUKSHANSKIY, M. D., KHAYKIN, S. Ya. and AGNIIVTSEVA, T. G.,  
Okhta Scientific Industrial Association "Plastpolimer"

[Abstract] The rate of oxidation of primary radicals in amorphous and crystalline regions of polymers differs, and can be used to study the supra-molecular structure of such polymers. ESR studies on the oxidation of radicals formed by gamma-irradiation (Co-60, 0.05-1 MGy) of polyethylene (PE) and polyvinylidene fluoride (PVF) demonstrated that only a fraction of the alkyl radicals undergoes oxidation with the formation of peroxide radicals. In the case of PVF three types of radicals were detected: stable unoxidizable fluoroalkyl radicals, stable peroxide radicals, and unstable peroxide radicals. The respective localizations of these classes of radicals are believed to be within crystallites, on the surface of crystallites, and in the amorphous regions of the polymer. The ratio of the

concentration of the stable peroxide radicals to that of the alkyl radicals provides an estimate of the specific surface area of crystallites. A decrease in the fluoroalkyl radicals and an increase in the peroxide radicals indicates that PVF crystallites are impermeable to oxygen. Analogous findings prevailed for high- and low-density PE, taking into consideration the smaller crystallites. Figures 4; references 5: 3 Russian, 2 Western.  
[236-12172]

UDC 541.64:539.2:547.458.82

EFFECTS OF MOLECULAR STRUCTURE AND COMPONENT COMPATIBILITY OF CELLULOSE ACETATE/POLYMETHACRYLATE GRAFT COPOLYMERS ON THEIR PROPERTIES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85  
(manuscript received 6 Jun 83) pp 469-476

TASHMUKHAMEDOV, S. A. (deceased), AKBAROV, Kh. I., PERENKULOVA, Kh. T., BURKHANOVA, N. D., OLENIN, A. V., ZUBOV, V. P., NIKONOVICH, G. V. and TILLAYEV, R. S., Tashkent State University imeni V. I. Lenin; Moscow State University imeni M. V. Lomonosov

[Abstract] Light-scattering and electron microscopy were used to study the effects of molecular structure and component incompatibility on thermodynamic, hydrodynamic, optical and structural characteristics of cellulose acetate-polymethacrylate copolymers. As the number of grafted polymethacrylate branches increased from 1 to 5 and the MW from  $3.0 \times 10^4$  to  $3.3 \times 10^6$  there was a concomitant increase in the mean quadratic radius of rotation, the second virial coefficient, and the viscosity of the macromolecule. The Huggins constant and the viscosity go through a minimum as the number of polymethacrylate branches increases, which indicates an initially greater solubility of the copolymer in various solvents, and subsequently a decrease in solubility. Determinations of the free energies of mixing were concordant with the solubility data. In addition, the high Hildebrand values for the cellulose acetate and polymethacrylate components also indicated their incompatibility. Figures 7; references 28: 14 Russian, 14 Western.  
[236-12172]

## IR SPECTROSCOPY OF ORIENTED COMB-LIKE LIQUID-CRYSTALLINE POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85  
(manuscript received 27 Jun 83) pp 477-485

ROGANOVA, Z. A., SMOLYANSKIY, A. L., KOZLOVSKIY, M. V., TAL'ROZE, R. V.  
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imeni M. V. Lomonosov

[Abstract] IR spectroscopy was employed in an analysis of the structures of liquid-crystalline acrylic and methacrylic polymers differing in the chemical nature of intermediate groups and the length of aliphatic linkage. Analysis of IR dichroism for the Schiff bases and esters in the region of smectic phases resulted in estimation of the degree of orientation of the aliphatic and aromatic side groups of the polymers. The data were interpreted to indicate that separation of the intermediate groups from the backbone via flexible bridges is a prerequisite for liquid-crystalline state of comb-like polymers. Elongations of the terminal alkyl chain was found to hinder spontaneous homeotropic orientation of the mesogenic groups on cooling of the polymers. Figures 6; references 14: 8 Russian, 6 Western. [236-12172]

UDC 541.64:539.2

## EFFECTS OF SIZE AND ORDERLINESS OF MACROCYCLES ON POLYROTAXANE SYNTHESIS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85  
(manuscript received 18 Jul 83) pp 556-562

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SSR Academy of Sciences; Institute of Organic Chemistry, Ukrainian SSR  
Academy of Sciences, Kiev

[Abstract] The effects of size and orderliness of macrocycles on polyrotaxane synthesis were studied in a system involving radical polymerization of styrene in the presence of cyclic urethane (CU-B, triethylene glycol + hexamethylene diisocyanate, or CU-A, diethylene glycol + hexamethylene diisocyanate), or in the presence of ordered cluster complexes of CU-B +  $ZnCl_2$  or CU-A +  $ZnCl_2$ . Polymerization of styrene was carried out in evacuated sealed ampules at room temperature for 3-5 months, catalyzed by trace quantities of oxygen. Polyrotaxane formation involved an initial stage of Cu swelling due to interdigitation of styrene molecules into CU and its complexes, resulting in 150% swelling of CU-A and 50% swelling of CU-B, and subsequent polymerization of the 'incorporated' styrene monomers. IR spectra yielded bands characteristic of both CU and polystyrene; furthermore, CU-B contained 75% polystyrene and CU-B +  $ZnCl_2$  complexes 65%. X-ray diffraction analysis indicated dispersed clusters of CU along the polystyrene chain, with considerably more CU-A +  $ZnCl_2$  moieties on the polymer than CU-B +  $ZnCl_2$  moieties. Figures 4; references 17: 1 Polish, 11 Russian, 5 Western. [236-12172]

EXPERIMENTAL STUDY OF REACTION OF  $D+H_2(v=1)$

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 3, Mar 85  
(manuscript received 24 Dec 83) pp 377-387

ROZENSHTEYN, V. B., GERSHENZON, Yu. M., IVANOV, A. V. and KUCHERYAVYY, S. I.,  
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[Abstract] The reaction of hydrogen atoms and molecules can follow adiabatic, non-adiabatic or relaxational channels. The present article reports on measurements of the reaction of  $D+H_2(v=1)$  at 300 K to determine reaction rates. The device used for conducting the experiments is diagrammed and described. It consisted of a thermostatic quartz tube 2 cm in diameter and 40 cm long, and a reactor coated with teflon for preventing destruction of atoms and oscillating molecules. Measurements of destruction of H and D atoms in the absence of the  $H_2$  molecule, conducted in a supplementary flow, were contrasted to the control reaction of  $D+H \rightarrow HD+H$ . Other measurements were of the heterogeneous destruction of the H molecule, and of absolute concentration of  $H_2$  using an immobile thermocouple. The unusual effect of a triple yield of atoms over the initial concentration of oscillating molecules is discussed, and comprehensive calculations are presented to explain the observations. Since the ratios between reaction constants were found to agree with those of other works, but theoretical conclusions diverge greatly, the authors believe that more experiments with other isotopes and greater accuracy in determining constants and temperature values must be determined before the given reaction can be thoroughly understood. Figures 5; tables 3; references 31: 8 Russian, 23 Western. [234-12131]



UDC 678-19:678.074

MECHANICAL AND STRUCTURAL CHARACTERISTICS OF COMPOSITES FORMED FROM  
FLUORINATED RUBBER AND POLYOLEFINS

Moscow KAUCHUK I REZINA in Russian No 3, Mar 85 pp 9-15

DONTSOV, A. A., NOVITSKAYA, S. P., LYAPUNOVA, V. D. and YUMASHEVA, O. A.,  
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[Abstract] An assessment was made of the effectiveness of polyolefins in improving the physicochemical qualities of fluorinated rubbers SKF-26 and SKF-32. Basically, the studies demonstrated that both low-density polyethylenes and ethylenepropylenes behaved as structural plasticizers. However, the latter were less effective because of inherently greater viscosity. In improving toughness, low- and high-temperature tolerance, and chemical stability in water and alkali both were effective, particularly when low doses of low-density polyethylene or high doses of ethylene-propylene were employed. Figures 10; references 9: 6 Russian, 3 Western. [232-12172]

UDC 678.684.82:532.135

RHEOLOGIC CHARACTERISTICS OF CONCENTRATED LIQUID THIOKOL DISPERSIONS

Moscow KAUCHUK I REZINA in Russian No 3, Mar 85 pp 22-23

FEDYUKIN, N. D., SHERSHNEV, V. A., IONOV, Yu. A. and DONTSOV, A. A.,  
NIIRP [Scientific Research Institute of the Rubber Industry]

[Abstract] Viscosimetric studies were conducted on concentrated liquid Thiokol dispersions containing different concentrations of carbon particles, in order to determine optimal levels for sealant preparation. Analysis of the semilogarithmic plots of the relative viscosity ( $\eta$ ) to the 'free volume' fraction ( $\phi_f = V_f/V$ ), showed that the viscosity was inversely proportional to the 'free' volume ( $V_f$ ). On the basis of the plots, the equation  $\lg \eta = a \cdot \phi + b$  was derived which, in combination with a table giving the values of  $a$  and  $b$  constants, provides information for the rheological characteristics of various concentrations of dispersion. Such

data can then be utilized in the preparation of sealant pastes with required technological properties. Figures 3; references 7 (Russian).  
[232-12172]

UDC 673.063:578.029.46:620.172.24

EFFECTS OF SHORT FIBER CONTENT ON TOUGHNESS AND CHANGES IN SPECIFIC VOLUME OF FIBROUS RUBBER COMPOSITES DURING STRETCHING

Moscow KAUCHUK I REZINA in Russian No 3, Mar 85 pp 24-25

POLYAKOV, O. G., KAMENSHCHIKOV, A. I., CHAYKUN, A. M. and DROZDOVSKIY, V. F., NIISHP [Scientific Research Institute of the Garment Industry]

[Abstract] The effects of short fibers on the toughness and durability of rubber composites were analyzed in terms of specific volume, since stretching of rubber is accompanied by vacuole formation which weakens the sample. The experimental studies were conducted with butadiene-methylstyrene rubber, SKMS-30RP, reinforced with 2.8 mm long capron fibers. While low fiber content (5 wt%) was shown to actually favor formation of the microdefects, higher content (10-20 wt%) of fibers increased tear resistance. Longitudinally arranged fibers were far more effective in increasing toughness, than those in a perpendicular orientation. Figures 2; references 6: 5 Russian, 1 Western.  
[232-12172]

UDC 541.64:532.4

INTERNAL FRICTION SPECTRA OF ELASTOMERS IN RELATION TO CRYSTALLIZATION AND CROSS-LINKING

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85 (manuscript received 21 Jul 83) pp 582-586

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[Abstract] Internal friction spectra for natural rubber (NR; polyisoprene) samples with different degrees of cross-linking were analyzed, demonstrating two relaxation maxima.  $\alpha_I$  transition was noted at  $-78^\circ$  for non-cross-linked samples and those with 1% S, and at  $-65$  to  $-70^\circ$  for cross-linked samples with 3-10% S. The respective  $\alpha_{II}$  transitions for both sample classes were observed at  $-52$  to  $-54^\circ$  and at  $-50^\circ$ , respectively. The splitting of the alpha process was evidently due to the fact that the amorphous phase of NR exists in two structural conformations, or to the formation of two different structures by low- and high-MW components of the polymer. The other maximum,  $\lambda_c$ , is not due to relaxation but reflects

mechanical changes in the polymer as a result of crystallization at the temperature favoring maximal crystallization rate. Figures 6; references 14: 2 Russian, 12 Western.  
[236-12172]

UDC 541.64:537.52

#### ACTIVATION OF POLYETHYLENE FILM BY ELECTRIC DISCHARGE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 3, Mar 85  
(manuscript received 5 Aug 83) pp 643-648

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[Abstract] Since electrical discharges are one of the most effective means of increasing adhesiveness of polyethylene (PE) films, an analysis was conducted of the surface changes induced by such means in conjunction with determinations of wettability because of the symbiotic relationship of these two factors. The activation process was found to consist of 3 stages. The initial stage consisted of oxidation of the surface PE layers with an increase in the concentration of C=C and C=O groups, leading to a decrease in the contact angle for water and increasing adhesiveness for a variety of materials. Surface changes evident on electron microscopy became more pronounced in the second stage and, along with the previous changes, extruded liquid material appeared on the surface which was removable with  $\text{CCl}_4$  and consisted of oligomers with a MW of ca. 1000. The second stage was characterized by maximal adhesiveness. In the third stage the contact angle fails to show any further changes while the oligomers continue to accumulate on the surface of the PE film, and eventually lead to loss of adhesive properties. Activation was most effective when conducted in air with a relative humidity of 40-60%. Short-term exposure to high pressure (10 MPa) or high temperature (120°C) diminished the efficiency of activation. Figures 5; references 25: 20 Russian, 5 Western.  
[236-12172]

## INFLUENCE OF LIQUID RUBBERS ON PHYSICAL-MECHANICAL PROPERTIES OF EPOXY POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 85 pp 25-26

KULIK, T. A., KOCHERGIN, Yu. S., ZAYTSEV, Yu. S., PAKTER, M. K. and  
ASKADSKIY, A. A.

[Abstract] Thermoreactive polymers based on epoxy oligomers are strong, rigid and resistant to various solvents but they are brittle and tend to crack easily. To improve their property, plasticizers, flexibilizers and solidifiers with flexible molecular chains are introduced; however, these additives lower the thermal stability and resilience of such polymers. One way to improve the impact and cracking stability is to add liquid carboxy resins. This aspect was investigated as it affected physical-mechanical and relaxation properties of epoxy polymers. It was shown that, in order to assure the desired effect in the epoxy polymers, it was necessary to esterify the carboxy groups of the rubber with the epoxy groups of the oligomer. Figures 2; references 10: 7 Russian (2 by Western authors), 3 Western.

[250-7813]

UDC 628.3:541.183

PURIFICATION OF EFFLUENTS FROM PRODUCTION OF INSECTICIDAL PREPARATION  
"DICHLOROPHOS" AT BREST PLANT OF HOUSEHOLD CHEMICALS BY ADSORPTION ON  
ACTIVATED CHARCOAL

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 28, No 3, Mar 85  
(manuscript received 27 Jan 83) pp 75-78

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[Abstract] Effluents of the production of insecticide "Dichlorophos" contain highly toxic insecticide--dimethyl-2,2-dichlorovinylphosphate (DDVP), kerosene and xylene, exceeding the maximum permissible concentrations. An attempt was made to develop an adsorption method for the purification of effluents from this production. An effective adsorbent was selected and the dynamics characteristics of the adsorption process were determined. This procedure included a sedimentation step to remove kerosene and xylene, recirculating them into the production cycle. Organic impurities were adsorbed on activated charcoal. It was shown that this process purifies the effluents from highly toxic contaminants to the level of permissive concentrations at a rather low cost. Figure 1; references 5 (Russian).  
[244-7813]

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